DOCUMENT RESUME

ED 235 136 SP 023 052

AUTHOR Fordham, Adrian M.
TITLE The Context of Teaching and Learning. Report on the First Phase of the IEA Classroom Environment Study. ACER Research Monograph No. 21.
INSTITUTION Australian Council for Educational Research, Hawthorn.
REPORT NO ISBN-0-85563-246-1
PUB DATE Jun 83
NOTE 145p.
AVAILABLE FROM Australian Council for Educational Research, 9 Frederick St., Hawthorn, Victoria, Australia 3122.
PUB TYPE Information Analyses (070) -- Reports - Research/Technical (143) -- Books (010)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Academic Achievement; Classroom Environment; Classroom Research; Classroom Techniques; Class Size; Elementary Secondary Education; Foreign Countries; *Mathematics Instruction; Mathematics Teachers; School Policy; *Science Instruction; Science Teachers; Student Attitudes; Student Characteristics; Teacher Behavior; *Teacher Characteristics; *Teacher Effectiveness; *Teaching Methods
IDENTIFIERS Australia

ABSTRACT

This publication describes the first phase of the Classroom Environment: Teaching for Learning Study in Australia, a six-year international research effort to identify correlations between teaching practices and student achievement. The report's first chapter presents a resume of the study and reviews research findings on managerial and instructional teaching practices which were the major focus of the study. Research studies on the context in which learning and teaching occur are reviewed in chapter 2. Context variables in these studies were teacher characteristics, school policy and organization, instructional setting, and student characteristics. Chapter 3 deals with the selection of relevant teaching practices and contextual factors and the development of the survey questionnaire. The survey sought information on teaching methods, teacher characteristics, and mediating influences on teaching practices. Chapter 4 describes the target population of teachers, the selection of a representative sample of teachers, and the survey procedures used in the collection of data. Chapters 5, 6, and 7 are concerned with the analysis of data collected from teachers during the survey. The final chapter offers a perspective on the study and summarizes features occurring in classrooms in Victoria. The features discussed are grouped under the headings which framed the survey questionnaire. A copy of the survey questionnaire and tabulated findings are appended. (JD)

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ED235136

ACER RESEARCH MONOGRAPH NO. 21

THE CONTEXT OF TEACHING AND LEARNING

Report on the First Phase of the IEA Classroom Environment Study

Adrian M. Fordham

U.S. DEPARTMENT OF EDUCATION
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ISBN 0 85563 246 1

Australian Council for Educational Research
Hawthorn, Victoria
June 1983

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Published by
The Australian Council for Educational Research Limited
Radford House, Frederick Street, Hawthorn, Victoria 3122

Printed and bound by
Allanby Press
1a Crescent Road, Camberwell, Victoria 3124

Cover design by Louise Coutts.

National Library Cataloguing-in-Publication data.

Fordham, Adrian, M. 1945-
The context of teaching and learning.

ISBN 0 85563 246 1.

1. Teaching. 2. Academic achievement.
3. Education - Australia. I. Australian
Council for Educational Research. II. Title.
(Series: ACER research monograph; no. 21).

371.3

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ACKNOWLEDGMENTS

Many people have helped throughout this study and they deserve our thanks. Teachers throughout the Victorian Education system completed questionnaires promptly and clearly at a time of the school year which was extremely busy, and we are grateful to them.

Finally we would like to acknowledge the computing assistance both in the form of rapid service and helpful advice from the staff of the Swinburne Computing Service.

CHAPTER 1

THE CLASSROOM ENVIRONMENT STUDY: TEACHING FOR LEARNING STUDY

The identification of teaching behaviours which most influence student achievement and attitude development has been of central concern to educational researchers during recent years. The initial pessimism which surrounded much of this research endeavour throughout the early 1970s has been replaced by a feeling amongst researchers that now there exists the beginnings of a sound body of knowledge about the influence of teaching practice upon student learning. Even quite different research strategies are producing similar views of what are important teaching behaviours. It seems appropriate therefore that a study should be undertaken into the effects of classroom practices upon student learning.

This volume reports on the first phase of the Classroom Environment Study: Teaching for Learning Study in Australia which is part of an international study of teaching and learning being undertaken by the International Association for the Evaluation of Educational Achievement (IEA). The proposed research has four aims: (1) to identify teaching practices associated correlationally with improved student achievement and attitudes; (2) to examine the relationship between the teaching practices and both contextual factors and student learning behaviours; (3) to determine the degree to which those teaching practices can be fostered through relatively simple teacher training programs, and (4) to determine the degree to which the training and the changed practices cause improved student achievement and attitudes.

A Resumé of the Classroom Environment Study

This Australian study has several distinct features. As part of an international study conducted by IEA it has a number of advantages. At the practical level the study brings together the expertise of a group of co-operating institutions and specialists in educational research around the world. In addition, at the theoretical level this enables the study to examine the generalizability of teacher effects not only within countries but between countries which differ markedly from Australia. The second major feature of the Classroom Environment Study involves the choice of teacher behaviours which warrant investigation. Following extensive literature reviews a set of teacher behaviour and classroom environment variables was selected by the participating international centres on the basis of: (1) their consistent and positive relationship with educational outcomes; (2) their association with effects that could be assessed within a relatively short time span; (3) their malleability as a teaching practice; and (4) their amenability to definition, observation, and measurement in an international study. As a result a set of 20 teacher behaviours was identified comprising both teacher managerial and instructional practices. The instructional practices being studied included the presentation of instructional cues, teacher questioning and the teacher use of feedback and correctives.

Before considering the third distinctive feature of the study, namely, the research design to be employed, the managerial and instructional teaching practices which constitute the major focus of the study will be briefly examined.

Teacher Management Practices

Classroom management procedures largely influence the amount of time students are actively involved in learning. Crawford and Gage (1977) identified a small group of management practices associated with high levels of task orientation and academic engaged time. The following practices were considered important for investigation in the Classroom Environment Study: (1) providing a clear set of rules, (2) taking immediate disciplinary action to halt student misbehaviour, (3) correctly identifying the student who was the source of misbehaviour, (4) taking mild disciplinary action rather than over-reacting, (5) monitoring seat work, and (6) stating clearly and briefly when activities would be changed and what would be the new activity. In addition, Good (1980) has stressed the importance of emphasizing periodically that academic work will be evaluated and then actually evaluating student learning.

Teacher Instructional Practices

Managerial practices are directed towards ensuring that students are involved in learning activities. Instructional practices relate more closely to what students do during learning activities. Three sets of instructional practices were considered important for investigation in the Classroom Environment Study. The first set, instructional cues, are associated with providing a context for future student learning by defining for the student what knowledge and skills are to be learnt in a particular course or section of work. In addition, instructional cues specify the more immediate learning tasks which concern the student during a specific lesson. While cues can be derived from textbooks and other instructional materials, important instructional cues come from the teacher. Research studies have demonstrated that giving students knowledge of the learning objectives and emphasizing important parts of the curriculum both during and at the end of lessons improve student learning (e.g. Crosson and Olson, 1969; Duell, 1974; Anderson, Evertson and Brophy, 1979; Clark, Gage, Marx, Peterson, Stayrock, Winnie, 1979).

The second set of instructional practices comprises oral questioning. Several aspects of questioning were considered important: types of questions asked, the frequency of questions and ways in which questions were directed and redirected to students. These questions serve several functions. First, the practice of questioning can maintain the student's attention to his or her work. Questioning may also suggest to the student the important parts of the curriculum to be learnt, and the likely types of questions to be used when assessing student achievement. Classroom questioning can therefore serve as an instructional cue. More importantly, questioning can guide the student's learning process and indicate to both student and teacher the student's current state of knowledge. The major research findings to date concern the teaching of basic skills such as mathematics and reading. In both these areas of teaching the frequency of factual single-answer questions asked by the teacher has been found to be positively related to the development of basic skills by the student. The more factual questions asked, the greater is student learning. By contrast there would seem to be a negative relationship between frequency of open-ended questions and student learning of basic mathematics and reading skills (Rosenshine, 1979). Furthermore, what has emerged from the research is that the most appropriate types of questions for teachers to ask will differ according to the year level and subject area. For example, recent studies of the teaching of high school English suggest that open-ended, opinion-oriented questioning is important (Evertson, Anderson and Brophy, 1978). This would be expected because questions of this nature more closely reflect the learning objectives of the curriculum and the procedures used in English to assess student performance.

Feedback and correctives constitute a third set of important instructional practices. Feedback refers to what the teacher does after a student has responded to an oral question, completed a work exercise or attempted a more formal written test. It may have a reinforcement function, although the research on the effects of praise upon student achievement has produced somewhat inconsistent findings (Rosenshine, 1971). Of greater importance is the cognitive-processing function of feedback. It tells the student whether the answers given are correct or not, identifies correct answers and provides information as to how improvements might be made. In so doing it also provides the student with an indication of his or her possible future level of achievement.

Research studies have consistently found that, in the case of traditional subjects such as mathematics and reading, feedback about the correctness of answers has a positive effect upon student learning. The provision of correctives to students following feedback further increases student achievement (Bloom, 1976). Such correctives can take the form of specifying material which should be reviewed, additional work-sheets and exercises focusing on the content and principles found in questions incorrectly answered, and individual explanations to students.

In summary, there are three sets of classroom instructional practices which research suggests influence student learning and which warrant investigation. These are: (1) presentation of instructional cues, (2) verbal interaction in the form of questioning, and (3) teacher use of feedback and correctives. The extent to which teachers are able to use these practices will be influenced, in part, by the more global teaching activities they initially decide to use during a lesson. Furthermore, the effect of these instructional practices upon student learning is likely to be mediated by student characteristics and other aspects of the classroom environment. Such influences will be examined in detail in the following chapter of this report.

The third distinctive feature of the Classroom Environment Study is the research design of the study. The design comprises three stages. In Stage I, information concerning school and classroom characteristics was collected by means of a teacher survey. This information will facilitate the interpretation of findings derived from the subsequent two stages of the study. In Stage II, the set of teaching practices have been observed as they occur naturally in classrooms, and the correlations between their occurrence and educational outcomes will be ascertained. In Stage III, the teaching practices found to be correlates of outcomes in Stage II will provide the focus of a training program and treatment condition. The training program will be given to teachers randomly assigned to an experimental group and will not be given to teachers randomly assigned to a control group. The control group of teachers will undertake an in-service program of similar type to those currently available. The practices of both trained and untrained teachers will be observed to ascertain the effectiveness of the training. Finally, the achievement and attitudes of the students of the trained and untrained teachers will be compared. In this way the causal effect of the teaching practices on student learning can be examined.

Overall the research program for the Classroom Environment Study will be of six years duration. This report summarizes the first stage of the study and relates to research activities undertaken during 1980. The second stage of the study will take place during 1982 and the third stage of the study will be carried out in 1985.

The Need for a Preliminary Study of Context

While the basic design of the study can be described in terms of first a correlational and then an experimental design, an important element in the design is a preliminary gathering of information concerning current classroom and system characteristics. Classroom characteristics include teacher characteristics, resources, and teaching and learning activities. Why gather contextual information of this sort prior to the correlational stage of the study? There appear to be several arguments for the inclusion of this preliminary stage, and these can be stated briefly.

First, in many countries it became evident that there was little existent knowledge about the types of teaching practices adopted by teachers, particularly the extent to which teaching practices varied between teachers. For example, the specification of instructional cues is a teaching practice about which little information has been collected. We do not know whether teachers in general specify to their students exactly what is to be learnt from their lessons and, if they do, whether this is done, for instance, at the beginning of lessons or during lesson summaries. In brief, it was considered of benefit to know the current use by teachers of the variables which were to be investigated during the correlational and experimental stages of the study.

A second argument concerned the extent to which teachers used the same teaching practices across different teaching situations. It was considered that the types of teaching practices used by teachers were influenced by a wide variety of factors, some beyond the immediate control of the teacher. The second chapter of this report examines in detail research evidence to support this proposition. By way of illustration, one type of contextual factor which might influence teaching practices is class organization.

A common form of class organization in Australian primary schools is the composite class. Composite classes comprise students of different year levels and a significant proportion of Victorian primary school classes are organized in this manner. A survey of teaching practices and classroom characteristics could begin to investigate the relationship between organization and the teaching practices adopted by teachers, as well as to document the extensiveness of this particular form of class organization. Similar classroom characteristics would be class size and class ability level. By searching for effects of such variables upon teaching practices in the preliminary stage of the study, the Classroom Environment Study would be in a better position to select classes for the subsequent correlational and experimental stages.

A third argument focuses upon the suitability of the proposed model of instruction for teachers within the educational system. Associated with this argument is a concern about whether teachers can be trained to implement the instructional model during the experimental stage of the study. As the research proposal points out, it is recognized that not all teachers are able or willing to adopt new teaching practices. The extent to which particular teaching practices are adopted and retained over a long period will depend on the educational beliefs and attitudes of teachers, the types of teaching practices they already use and other characteristics of the classroom. A survey of teacher characteristics and system characteristics likely to influence the introduction of the proposed teaching practices would appear a necessary part to the overall study. This is more clearly evident in terms of the long-term goals of the Classroom Environment Study which are policy oriented and concern the widespread use of these practices by teachers.

The present study can be viewed in relation to several other studies which have been undertaken by the Australian Council for Educational Research during recent years. The first two of these studies are the First IEA Mathematics Study and the Second IEA Mathematics Study. Twelve countries participated in the First IEA

Mathematics Study, which was co-ordinated by the International Association for the Evaluation of Educational Achievement (IEA). Findings from the data collected in the Australian study have been reported by Keeves (1968). The Second IEA Mathematics Study was undertaken during 1978 and enabled a comparison to be made of mathematics education over the period of 14 years from 1964 to 1978. Australian results from this study have been reported by Rosier (1980) and Moss (1982). Following the First IEA Mathematics Study, the Australian Council for Educational Research participated with some 20 countries in the IEA Six Subject Survey. Of particular interest for the present study is the study of science education in 19 countries. Results of the Science Study have been reported by Comber and Keeves (1973). Both the Mathematics Studies and the Science Study were survey studies of mathematics and science education in the participating countries. In 1983, a Second IEA Science Study will be undertaken in Australia.

Not only were these IEA survey studies intended to provide a description of the teaching of mathematics and science but also to relate social, economic and systemic characteristics to student achievement and attitudes in the respective subject areas. In contrast to the Classroom Environment Study, neither the Science nor the Mathematics Studies were concerned with specific teaching practices of the type described in the previous section. Rather these studies described the teaching situation mainly in terms of such variables as the amount of homework set, the opportunity-to-learn concept, the regular study of the subject, and the use of concrete teaching materials. This is not surprising as these types of variables are much more amenable to measurement using survey techniques. The usefulness of the IEA Mathematics and Science Studies for the present study is the rich source of background information they provide, particularly for the design of the initial stages of the study.

This first report of the Classroom Environment Study describes the initial stage of the study. It is, however, important to view this first phase not only as part of a more substantial study extending over a period of several years, but also as part of an ongoing program of research conducted by the Australian Council for Educational Research in collaboration with the International Association for the Evaluation of Educational Achievement into factors which are related to achievement and attitudinal outcomes in schools both in Australia and many other parts of the world. The particular purpose of this report is to provide an account of the classroom context in which learning occurs in Australian schools.

CHAPTER 2

THE CONTEXT OF TEACHING AND LEARNING IN THE CLASSROOM ENVIRONMENT STUDY

The IEA Classroom Environment: Teaching for Learning Study is an investigation of the effectiveness of certain types of instruction upon student learning. These types of instruction have been incorporated within a model. The instructional model comprises teacher management practices, student time-on-task, teacher instructional practices and student learning. Furthermore, a set of specific teacher behaviours has been proposed which constitute the teacher management and instructional practices. Each of these specific teacher behaviours has been defined independently of the context in which teaching and learning occur. For example, the teacher behaviour 'presentation of objectives' is defined without reference to the type of curriculum objectives presented by the teacher. Monitoring student seat work is another teacher behaviour central to the proposed instructional model. In this case the specific teacher behaviour is defined without reference to the number of students in the class, and hence the amount of seat work to be monitored by the teacher. Both the type of curriculum and class size are quite different kinds of variables yet they have one important characteristic in common. They provide the context for the proposed instructional model.

The study of the context in which learning and teaching occur has not previously held an important place in much classroom-learning research. For example, teacher effectiveness research, with its emphasis upon process-product studies, has sought to identify quite specific teacher behaviours which have generalized effects across a wide range of instructional settings. Implicit in this approach has been the supposition that, once such teacher behaviours have been identified, training programs can be established in order to train teachers to adopt those behaviours within their classrooms. The training programs themselves do not take cognizance of the context in which the teacher will subsequently use the newly acquired teaching skills.

The predominance of process-product studies in the late 1960s, with their lack of concern for the influence of context variables, has more recently waned. There has been a shift from the strict adherence to the process-product paradigm to one which includes a consideration of the relationship between context variables, such as year level and the socio-economic status of the student, and both teacher behaviours (process) and student learning outcomes (products). In addition, the influence of materials, pacing, content and time allocation are currently being studied within the process-product paradigm.

Two recent surveys of research in this field (Shulman, 1977) addressed themselves to the need for a broader consideration of both the context and the teaching process. In addition, the convergence of quite different approaches to the study of classroom learning and student achievement was noted. In the first of the two reviews, Barr and Dreeben (1977) distinguished two traditions of research on school effects which have tended to remain in isolation from each other. The first tradition has focused on the study of models of instruction, such as that underlying the present Classroom Environment Study proposal. The second is more recent in origin and has examined the relationships between teacher characteristics, school resources, and student characteristics and their effects upon student achievement. Although such an approach can be applied to the effects of individual classrooms, it has generally been concerned with school effects. The challenge for educational researchers interested in studying student achievement is to integrate both school effects and classroom effects, including teacher effects, within an overall instructional model. In the second review article, Doyle (1977) draws attention to the potential contribution of researchers employing alternative approaches (e.g. ecological, descriptive) to the study of classroom learning, particularly in the provision of an interpretative framework for instructional effects derived from process-product studies. These alternative approaches are characterized by a willingness to examine the complexity of the context in which specific teaching behaviours and student learning processes occur.

The implications which follow from an examination of these recent surveys of research into teaching effectiveness are quite clear for the Classroom Environment Study. The degree of interpretation which might be placed upon results obtained from the Classroom Environment Study will remain extremely limited unless there is a careful consideration of the context in which the specific teaching behaviours are studied, for it cannot be assumed that specific teacher behaviours of the sort proposed will have generalizable effects upon student achievement and attitudes across a wide variety of educational settings both within and between participating countries. In fact the weight of research evidence would suggest that this will not be the case. However, a major difficulty for those research workers engaging in the Classroom Environment Study is to determine the important components of the context in which teaching and learning occurs in their educational system(s), especially those aspects most likely to affect the proposed set of management and instructional teaching practices.

This chapter considers the breadth of meaning attached to the teaching-learning context, and proposes a set of contextual variables which are most likely to influence teaching practice.

The Context of Teaching and Learning

The context of teaching and learning generally refers to the teacher, the student and the surroundings in which both teacher and student work. Within this broad understanding of context, researchers have tended to focus upon specific aspects: student characteristics, classroom organizational characteristics, teacher characteristics, classroom climate and school resources. With the exception of classroom climate, each of these variables represents relatively fixed constraints which operate in the school and classroom and affect instruction.

A substantive contribution to the study of contextual influences upon instruction derives from the notion of frame factors (Dahllöf, 1971). Frame factors comprise physical resources and organizational characteristics which are fixed or relatively stable over time and which either directly or indirectly influence the teaching process. Frame factors include both between-school factors and within-school factors. Examples of between-school factors are school size, school location and student social class; examples of within-school factors are student grouping and number of lessons per week. Frame factors are determined by the particular aims of a system. In turn they may affect the suitability of different models of instruction and the attainment of specific objectives. It is even conceivable that some may influence the determination of the overall goals of the system or school; however, such a consideration is not evident in Dahllöf's conceptualization of frame factors. Although the impact of frame factors upon teaching processes has not been extensively examined by Dahllöf (1971), the paradigm that he has advanced does provide one approach to the selection of relevant context variables for the Classroom Environment Study.

Frame factors can be contrasted with a quite different type of context variable; namely, classroom climate. Classroom climate refers to dimensions of the psycho-social environment with which students interact during instruction. Recent research in this area has focused upon the determination and evaluation of classroom climate (Anderson and Walberg, 1974; Trickett and Moos, 1974), the effects of classroom climate upon student achievement and attitude (Fraser, 1979; Johnson and Johnson, 1979), and the relationship between classroom climate and teaching practice (Johnson and Johnson, 1974).

Unlike frame factors, dimensions of the classroom climate may be influenced by teacher management and instructional practices. For example, the dimension 'goal direction' (Anderson and Walberg, 1974) is likely to be influenced by the degree to which the teacher presents learning objectives and emphasizes important parts of the lesson. Some dimensions of the classroom climate are likely to be more stable over time. Competitiveness (Anderson and Walberg, 1974) would be one such example. This variable will be influenced by the overall school climate and reflect closely the social values of parents, teachers and students of the school as a whole, as well as being influenced by specific teacher behaviour.

A third set of context variables concerns the teacher and student. Both bring to the instructional situation a set of prior experiences in the form of beliefs and values about instruction as well as accumulated knowledge in relation to the the curriculum. In addition teachers and students differ according to a wide variety of demographic factors, many of which may indirectly affect teaching practices and student learning (Dunkin and Biddle, 1974).

Each set of context variables which has been mentioned is not likely to influence independently student achievement and attitudes. Rather one can envisage a model of school, teacher and student variables which influence student learning in such a way that some effects are direct and other effects are mediated by remaining variables in the model. One would also expect stronger relationships to exist between student achievement and attitudes and teacher and student variables than between these dependent variables and school variables. This is because teacher and student variables conceptually, and in practice, are more directly linked to student learning outcomes.

Centra and Potter (1980) have presented one such structural model of student learning which comprises school or school district factors, within-school conditions, teacher characteristics and student characteristics. Within this model these factors are related to teacher behaviour, student behaviour and finally to student learning outcomes. In this way Centra and Potter are attempting to bridge the two thrusts of research on school learning described by Barr and Dreeben (1977).

It is clear that the context in which teaching and learning occurs is not easily defined. Furthermore, as far as the Classroom Environment Study is concerned, some context variables that have been mentioned may not be easily adapted or even validly applied cross-nationally. Classroom climate is a case in point. Dimensions of the classroom climate have been derived largely from research in the United States and few data are available concerning their appropriateness in other countries. Nevertheless, several broad categories of context variables are described below. These categories are teacher characteristics, school policy and organization, instructional setting and student characteristics. School policy and organization constitute frame conditions for teaching processes. The instructional setting comprises both frame factors and dimensions of the classroom climate. Generally teacher and student characteristics are relatively stable and may be treated as frame conditions for the operation of the instructional model. In addition, some teacher and student characteristics will be less stable and change during the course of instruction. Within each general category context variables are proposed.

Teacher Characteristics

The influence of several types of teacher characteristics upon teaching practice and student achievement has been investigated. Background and demographic variables which have been studied include age, sex and years of teaching experience. For example, Adams and Biddell (1970) examined the effects of teacher age upon the teaching practices adopted in the classroom. Of particular interest are their findings that teacher age affects the group structure of the class, younger teachers tending to employ small group learning situations more so than older teachers; that when employing small groups, older teachers are more likely to adopt a peripheral role in their functioning; that older teachers are more likely to locate themselves at the front or centre of the class; and that, for older teachers, the students with whom they directly interact are more likely to be found also at the front or centre of the class. The relationships between group structure and spread of teacher-student interactions and between student engaged time and teacher management practices will be discussed in the section dealing with the instructional setting. However, the possible influence of teacher age, and perhaps teacher experience, upon both of these classroom practices should be noted. In studying the effects of teaching experience, Wright and Nuthall (1970) found that more experienced teachers tended to ask higher-order or more open types of questions and to allow their students greater opportunity to explain and expand their answers to questions.

In the Beginning Teacher Evaluation Study, McDonald and Elias (1976) examined the relationships between teacher characteristics and classroom teaching behaviour. The teacher characteristics included subject knowledge and attitude and the classroom teaching behaviours included types of instructional organization and activities and the variety of educational aims adopted and materials used. McDonald and Elias concluded:

> . . . many of the paths from the teacher scores to instructional behaviors were large and at or near significance, very few of the teacher scores showed a consistent relationship across instructional behaviors at both grade levels and for both reading and mathematics. (McDonald and Elias, 1976:128)

One difficulty of examining the effects of such background characteristics as teacher age and teaching experience is that relationships with teaching practices may not be linear; in fact many are likely to be curvilinear. In regard to the effect of teaching experience upon student achievement, one interesting finding has emerged from Summers and Wolfe (1975) which illustrates the difficulty of establishing simple linear relationships between teacher background characteristics and dependent variables such as teacher practices or student achievement. Summers and Wolfe found that teaching experience had differential effects upon the academic performance of high ability and low ability students. It was found that high ability students at the primary school level did best with more experienced teachers and low ability students showed greater achievement gains with less experienced teachers. The student-aptitude interaction effect displayed by these findings was further refined in Summers and Wolfe's (1975) examination of the relationship between student ability, teaching experience and student achievement at the high school level. A further interactive effect with subject matter was found. High ability students benefited in their learning of English when taught by very experienced English teachers. For mathematics the pattern which emerged was quite different. Teachers who had 10 years or more experience had a negative effect upon their students' achievement in mathematics. By contrast, teachers with between three and 10 years of teaching experience were more effective in their teaching, as indicated by the level of mathematics performance of their students.

In their review of the relationship between presage variables and teaching processes, Dunkin and Biddle (1974) concluded that presage variables, in general, have not been good predictors of teaching practices. Instead they placed greater emphasis on the need for future research studies to examine the formative experiences of teachers and the consequent educational beliefs developed by the teacher. These beliefs concern the teacher's attitudes to the goals and objectives of the curriculum and different teaching practices. Dunkin and Biddle concluded that:

> a reasonably good prediction of the classroom behavior of the teacher can presumably be obtained by finding out what the teacher thinks she prefers to, ought to, and will do in the classroom. (Dunkin and Biddle, 1974:412)

A similar view is expressed by Brophy and Good (1974).

There have been only a few studies examining the extent to which teachers' educational beliefs influence teaching practice. Ashton, Kneen, Davies and Holley (1975) found consistent relationships between the teaching practices adopted by teachers and teachers' attitudes to particular educational aims and objectives. Teachers who considered that the primary aims of education involved the acquisition of skills and attitudes necessary for students to adjust to society tended to adopt a teacher-directed approach to instruction. On the other hand, teachers who considered that the primary aim of education was to facilitate the development of individuality among students, particularly in regard to their abilities and interests, tended to adopt a more child-centred enquiry teaching style.

Bennett (1976) considered three aspects of the teachers' educational belief system which comprised teaching aims, opinions about educational issues, and opinions about teaching methods. As was the case with the study by Ashton et al. (1975), teachers' opinions about educational issues, teaching aims and teaching methods were firmly held and were consistent with the teaching practices adopted in the classroom. By contrast, Power and Tisher (1979) found only slight support for the relationship between teacher beliefs about educational goals and specific classroom activities. A similar finding was obtained by Evertson, Brophy and Crawford (1975), who found that there was little evidence that teachers' opinions about specific teaching practices influenced the specific teaching practices which they actually used in the classroom. The latter two studies have in common a focus upon specific teacher behaviours, in contrast to the more global teaching styles examined by Ashton et al. (1975) and Bennett (1976). These differences may reflect the difficulty of seeking reliable estimates of teacher attitudes to teaching practice. One would expect that teachers would have formulated definite opinions about overall teaching styles such as teaching for enquiry and teacher-directed instruction. These topics would be often discussed in staff-rooms and teacher journals. However, teachers may not be able to report reliably upon their attitudes to specific teaching behaviours. This would be particularly so where teachers had had no prior experience in analysing specific elements of their overall approach to teaching. Furthermore, Evertson et al. (1975) have pointed out the importance of seeking teacher attitudes to specific teacher behaviours and teacher estimates of actual teaching practice in terms of specific teaching situations. Denoting a specific context provides a basis on which teachers can examine their attitudes to various teaching practices and analyse their actual teaching behaviour.

The influence of teacher beliefs upon teaching practice is not as straightforward as one might expect, although their importance is generally acknowledged. The teaching style implicit in the Classroom Environment Study proposal is closely oriented towards the maintenance of student time-on-task. This is accomplished by the creation of a task oriented environment, in which the teacher closely defines the body of knowledge to be learnt at each point of the lesson, interacts with students by means of frequent questioning, establishes student expectations of testing and grading, and provides frequent diagnostic testing and corrective instructional materials. Such a teaching style has many elements in common with direct instruction (Rosenshine, 1979) and teaching towards mastery (Bloom, 1976). It can be expected that teachers will differ in their attitudes to such a teaching style. However, teachers may not have previously analysed their teaching in terms of these practices. The caution being expressed is more methodological than conceptual. The evaluation of teachers' attitudes to specific teaching behaviours is invaluable but greater care will be required for their measurement than might be expected.

Teachers also develop certain expectations about the students they are teaching. Of particular interest is whether a teacher's expectation of a student's future academic success influences the teacher's behaviour towards the student. Although induced teacher expectation studies have proved controversial (e.g. Rosenthal and Jacobson, 1968) a series of carefully controlled naturalistic studies has been undertaken by Brophy and his colleagues (Brophy and Good, 1974). These studies provide interesting insights into teacher expectancy effects. Most importantly they suggest that the effects of teacher expectations of future student academic success upon teacher behaviour are not generalizable to all teachers. Brophy and Good conclude that:

> teacher expectations have the potential for affecting the amount that the student learns, and indirectly, by affecting his motivation to learn. (Brophy and Good, 1974:119)

The important point to note is that teacher expectations only have the potential but do not necessarily affect student-teacher interactions. There does appear to be a small group of teachers who interact most often with students they expect to do well, and in such a way as to facilitate increased learning amongst those students. These teachers tend to interact less often or in a manner less likely to lead to learning with students not expected to do well. On the other hand, there is a group of teachers, possibly the majority, who compensate for the low achievers. For example, Evertson, Brophy and Good (1972) found that the low achievers' lack of desire to participate in public interaction was compensated by teachers deliberately seeking out private interactions with the low achievers.

The overall effect of teacher expectancy upon student achievement was investigated by McDonald and Elias (1976). They found that teacher expectancy was consistently and significantly related to student achievement (after either statistically controlling for the effects of student entry ability or examining the influence of teacher-expectancy upon residual gain scores). The effect, however, was quite small and amounted to between 3 and 9 per cent of variance in student achievement.

Teacher expectancy effects do not operate solely upon individuals within a class but rather may operate upon the class as a whole. Teachers build up expectations of what they expect their class to complete over a period of time. This refers to both quantity and type of subject matter covered (Keddie, 1971). Teachers may not take into consideration all their students in defining the extensiveness of the curriculum to be taught. The curriculum which is covered is often defined in terms of the teacher's expectation of what the steering group within the entire class is likely to accomplish satisfactorily. Lundgren (1972) has argued that the steering group consists of those students expected to rank between the 10th and 25th percentile on class achievement measures.

Closely associated with the importance of teacher expectancy, and probably a product of it, is the rate at which the curriculum is presented to the class. Good, Grouws and Beckerman (1978) report that, in one study, more effective mathematics teachers (defined in terms of their students regularly achieving academic success) averaged 1.13 pages of the textbook per day. By contrast, less effective teachers averaged only 0.71 pages per day. However, no data were presented which examined the relationship between pacing and types of teacher-student interaction. The concept of pacing is relevant to the Classroom Environment Study. We can expect considerable differences between teachers and schools in the rate at which the learning units under examination are taught. Viewed as an independent variable, the relation between pacing and student achievement is an interesting one. Pacing may have a direct effect upon student learning. In addition, pacing may influence specific teaching behaviours and have an indirect effect on student achievement.

School Policy and Organization

Teachers' attitudes to educational practice constitute only one determinant of classroom behaviour. It is generally believed that school aims, structures and resources often exert a major influence upon the teaching process (e.g. Dahllöf, 1971). Bredo (1980) cites a small number of studies which have examined the effects of school size, the social background of the student body, and the expectations of the principal and peers. Generally the findings have been inconsistent in the case of the effects of school size and school social-class composition upon teaching practices. Somewhat more consistent have been those findings relating peer-group expectations with teaching practices adopted by individual teachers. Bredo (1980), in a study of primary school teachers, found that among school-level variables the most consistent predictor of a teacher's approach to instruction was that adopted by other teachers in the school; there was little relationship between a principal's expectations of teaching practices to be used and those actually adopted by classroom teachers. Yet, overall, there is little research evidence available which examines the effects of school organizational constraints upon classroom instruction. As was noted earlier, this has been a major deficiency in the research directed towards school effects and student achievement. Notwithstanding, it is possible to suggest several organizational factors operating within the school which seem relevant to the Classroom Environment Study. The first concerns teacher autonomy.

Teacher autonomy in the method of presentation of the curriculum is determined by senior administrators, in both the system and the school, and by teaching colleagues at the subject department level. Each group may either directly or indirectly restrict the implementation of the proposed instructional model, or particular elements contained within it. For example, the specific management practice associated with establishing student expectations of testing and grading may be incongruent with the philosophy of school or department. However, as is the case with teacher attitudes, it would seem that school and department constraints are more likely to influence the overall instructional model implicit in the proposed set of teacher management and instructional behaviours. If a school or department adopts an overall approach to teaching, whether it be teacher-directed or pupil-centred, specific teacher behaviours will be affected.

School policy will determine the diversity of curricula taught by a particular teacher. The number of different classes, the number of different subject areas taught by the teacher, and the relative importance attached to each are further influences upon the teaching practices adopted by the teacher. The greater the diversity of curricula taught, the less time there is available to the teacher for lesson preparation and the greater the stress in establishing and maintaining pedagogically sound teacher-student relationships. As a result, increased curriculum diversity may lead to a strategy of teaching similar to the coping strategy described by Westbury (1973).

The teacher's access to specialist ancillary staff (laboratory assistants and teacher aides, for example) is another feature of the school organization that is likely to affect teacher behaviour within the specified teaching area. For example, when teacher aides are available, they may enable teachers to adopt a more differentiated teaching style, using small-group work and being more student-centred (see Bredo, 1980). Teacher aides may also directly interact with students and thereby influence learning outcomes. Similarly the availability of support staff outside the classroom might be an important consideration, in so far as it will provide teachers with greater time for lesson preparation and correction.

The Instructional Setting

The instructional setting refers to both the physical properties of the teaching area, commonly a conventional classroom or science laboratory, and the psycho-social dimensions or climate variables which characterize the area. In complementing the study's primary concern for specific teacher behaviours, instructional setting also includes more global teacher-student and student-student interactions directed towards the attainment of learning objectives. Included in this latter category would be laboratory work, classroom discussion and seat work.

The effect of the physical properties of the teaching area upon teaching practice and student achievement has been subject to a considerable amount of research during the last decade. Probably most emphasis has been placed upon the relation of class size to student achievement and attitude development. Major reviews of the class size literature, in the form of meta-analyses by Glass and Smith (Glass and Smith, 1978; Smith and Glass, 1979), indicate the importance of considering class size as a factor affecting student learning. Reduced class size is associated with increased student achievement (Glass and Smith, 1978) and a higher quality of schooling and more positive attitudes on the part of both teachers and students (Smith and Glass, 1979). A case study of the effects of reducing class size by Filby, Cahen, McCutcheon and Kyle (1980) suggests that student time-on-task increases in smaller classes and that less teacher time is spent in classroom management. Unfortunately no data are presented on the relative amounts of specific instructional practices occurring in classes of different size, although one would expect that such differences would occur.

Class size could be expected to have differential effects upon the various teacher management and instructional behaviours. For example, a smaller class size would facilitate the monitoring of seat work and taking immediate disciplinary action, both teacher behaviours engendering increased academic engaged time. By contrast a smaller class size may not influence the teacher's presentation of instructional cues. In regard to the frequency of occurrence of teaching practices, knowledge of the class size would be extremely valuable. For example, the degree to which the teacher asks questions may be measured in terms of the absolute number of questions asked in a lesson. Alternatively it may be measured in terms of an index reflecting the number of questions per student asked in a lesson. A similar comment applies to the measurement of several other instructional variables. It could be expected that class size might also interact with the proposed set of management and instructional practices. The teacher's explicit presentation of instructional cues may not be as influential in small classes as it is in large classes. These research questions have not been investigated. The exploratory nature of the survey and correlational stages of the Classroom Environment Study provides the opportunity for such possible interactive effects to be studied.

Related to class size are the 'spread' of teacher-student interactions and the grouping of students for learning. The study by Adams and Biddle (1970) demonstrates that most teacher-student communication occurs in the front and centre of the classroom area. This 'action-zone' has been found to be associated with student achievement (Brophy and Good, 1970; Rist, 1970), although the causal direction of the relationships is unclear. Do the more interested students, those who wish to participate in the class, select to sit in the front and centre seats? Or does a central seating location lead to favourable attitudes to the curriculum and enhanced student achievement? After reviewing studies examining the direction of this relationship, Weinstein (1979) concluded that probably a front-centre seating location does facilitate participation, achievement and positive attitudes. This suggests that it would be useful in the Classroom Environment Study for the measurement of teacher-student interactions (e.g. questioning) to examine the location of students with whom the teacher is interacting. It would also be valuable to gain some indication of the effects of seating location on student-engaged time.

The effects of grouping students within a class upon teaching practices, student-engaged time, and student achievement have been demonstrated in the Follow through Evaluation Study (Stallings and Kaskowitz, 1974) and the Beginning Teacher Evaluation Study (Filby and Maliave, 1977; Fisher, Filby and Maliave, 1977). Teachers working with both small groups (three to seven students) and large groups obtained higher class mean achievement scores than teachers working with individual students. When students were not directly interacting with the teacher, as would be the case during individualized teaching, there was a reduction in the class mean academic engaged time. Rosenshine (1979) argued that this in turn led to reduced student achievement.

The use of grouping practices may itself be influenced by the ability range within the class. Teachers of classes in which there is a wide range of student ability are more likely to group students according to ability (Barr, 1975). Furthermore, in those classes where grouping practices are adopted, differential pacing of lessons between groups can occur.

A second aspect of the instructional setting comprises the teaching resources available for instruction. In a review of research studies which examined the influence of facilities (e.g. availability, location of rooms, quality and design) Ainley (1981) concluded that facilities were related to the teaching practices adopted by science teachers. In an evaluation of the Australian Science Facilities Program, Ainley (1978) found that being in science rooms, using rooms of good quality, and having sufficient apparatus were associated with effective classroom management and greater use of enquiry-based teaching skills. Apart from facilities of the type described above, the availability of other teaching resources such as instructional materials (films, slides, and reference books) would likewise be expected to influence teaching behaviour. In other subject areas, the effects of facilities are less consistent, as shown by research on open-space design teaching areas, furniture arrangement, noise and crowding (Angus, Evans and Parkin 1975; Summers and Wolfe, 1975; Weinstein, 1979). In searching for effects of resources upon teaching styles, it would seem that insufficient emphasis has been placed upon identifying teaching practices (dependent variables) which are logically consistent with the resources being investigated (independent variables). The study of the effects of resources upon teaching practices is a largely unexplored area of research.

Major classroom activities in which the specific teacher management and instructional practices are embedded constitute a further aspect of the instructional setting. Unlike frame factors such as class size and teaching resources, major classroom activities are not fixed constraints but can be changed by the teacher. Stallings, Needels and Stayrook (1979) examined the effects of classroom activites such as students reading silently, students doing written assignments, teacher instruction, discussion, and social interaction upon student achievement. Teacher instruction and discussion were positively related to student achievement. Unfortunately, the observational instrument used by Stallings did not allow an examination of the types of specific teacher behaviours occurring during each classroom activity. However, it was found that variables associated with classroom activities accounted for more of the variance in student achievement than did specific teacher behaviour variables. This would seem to emphasize the need to investigate the effects of more global classroom activities, possibly mediated by the proposed set of management and instructional behaviours, upon student achievement.

Good (1980) argued that merely examining the influence of specific teacher behaviours within the context of particular classroom activities does not go far enough. It is necessary for the researcher to investigate relationships within the context of the entire lesson, rather than within the context of specific aspects of it. It is probable that significant process-product correlations are themselves conditional upon the total structure of the lesson.

The effects of teaching practices upon student achievement have not been found to be generalizable across subject areas and year levels (e.g. Evertson, Anderson and Brophy, 1978; Evertson, Anderson, Anderson and Brophy, 1980). Furthermore, Evertson, Anderson, Edgar and Minter (1977) found that the type of subject matter taught influenced types of teaching behaviours adopted by some teachers for the same students. The general consensus amongst researchers involved in teacher effectiveness studies is that elements of the direct instruction model (such as maintenance of time-on-task, frequent lectures, teacher-led discussions) do generalize to higher year levels, provided that the major educational aim is that of basic skill mastery (Brophy, 1979). Consequently, it is necessary to view the curriculum setting as a context variable. The curriculum setting could be defined in terms of objectives, content and prescribed instructional materials.

School policy will determine the duration and distribution of class lessons for the curriculum under examination. Both length of lessons and the spread of lessons throughout the school week are curriculum variables likely to influence teaching practices. Furthermore, the effectiveness of teaching practices, particularly teacher management practices, may be dependent in part upon the length of time the class has been together. Anderson and Evertson (1978) have found that the management behaviours adopted by teachers early in the school year are sound predictors of student attention and involvement later in the year. This suggests that the effectiveness of training teachers to adopt prescribed practices during an experimental investigation may be dependent upon the time of the school year the experimental work is undertaken. Stable patterns of classroom management may either not be readily changed midway through the school year, or their effects may endure throughout the experimental phase even though the teacher may well introduce different management practices.

Classroom climate comprises the final set of contextual variables which appear relevant to the Classroom Environment Study. Some dimensions of the classroom climate are relatively independent of teaching practices. Cohesiveness and Favouritism are scales within the Learning Environment Inventory (Anderson, 1971) which appear to be in this category. Some dimensions of the classroom climate will be largely influenced by the overall school climate, although classroom teaching practices may contribute to their intensity. Competitiveness is one such example where there is likely to be a large school influence (perhaps because the social values of parents, teachers, and students) as well as an influence from the individual teacher's behaviour in establishing student expectation of testing and grading. It may well be that in this instance the overall school climate will directly influence the teacher's behaviour.

'Task orientation', a term which refers to the extent to which class activities focus upon the accomplishment of specified academic objectives (Trickett and Moos, 1974), has been shown to be consistently and positively related to student achievement (Rosenshine and Furst, 1971; Rosenshine, 1979). Evertson and Anderson (1978) found that teacher task orientation was positively related to mathematics achievement in the secondary school. In their study of teaching basic reading skills in secondary schools, Stallings, Needels and Stayrook (1979) also found that task orientation was positively related to student achievement. Neither study examined the relationship between specific teacher behaviours occurring in the classroom and this climate variable. In contrast to these findings concerning task orientation, studies of relationships between other classroom climate variables and student achievement and attitude have produced inconsistent findings (Anderson and Walberg, 1974; Brophy and Evertson, 1974; Fraser, 1979; Power and Tisher, 1979).

Student Characteristics

Students constitute the third element in the context of teaching and learning. A wide range of student characteristics has been studied in order to predict student achievement. Generally these characteristics are beyond the scope of the Classroom Environment Study. However, it is valuable in a discussion of the influence of context upon teaching practices to identify student characteristics which are likely to influence specific aspects of the proposed instructional model. There are several points in the model where such influence might occur. They include the managerial and the instructional practices adopted by the teachers, and the amount of student engaged time.

The effect of student characteristics upon teaching practices will in part be mediated through teacher expectancy effects of the sort described earlier in this chapter. Student ability and student socio-economic status (SES) are two student characteristics which are major determinants of teachers' expectations of student achievement (Brophy and Good, 1974). In addition, both student ability and student SES will have a direct effect upon teaching practice. We have already noted that, although low-achieving students tend to participate in public discussion less than higher-achieving students, teachers may compensate by interacting privately with those students. Evertson, Brophy and Crawford (1975) investigated the effect of sex and SES of students upon teaching practices. While few sex differences emerged, the effect of student SES upon teaching practices was pronounced. Teachers interacted quite differently with students found in classrooms of differing SES. In high SES classrooms, they adopted a businesslike approach to teaching; in low SES classrooms, teachers interacted more personally with the students. Evertson, Brophy and Crawford (1975) also found that nearly all differences in the teaching practices observed were correlated positively with student achievement. This is not surprising since SES has been found to be related to student ability and attitudes, and is likely to affect the manner in which teachers and students interact. The review by Medley (1978) reached a similar conclusion in regard to teaching students of differing SES. The important point to note is that, where classes comprise students of widely differing SES, the teacher is placed in an unenviable situation: optimizing the academic achievement of one group of students may well reduce the level of achievement of another group.

The review by Brophy (1979) of those teacher effectiveness studies which have examined aptitude-treatment interaction effects led him to conclude that once again this form of analysis of process-product research will become important:

> Certain trends are already evident; direct instruction (and close teacher monitoring and supervision generally) are needed more by students who are anxious and dependent, distractable, low in ability, or low in achievement motivation. Students with opposite traits can handle more of their learning independently. (Brophy, 1979:5)

However, the aptitude-treatment interaction effects operating within the classroom are likely to remain quite complex (Ebmeier and Good, 1979) and this complexity has limited their application to teaching practices in the past. It would seem more useful in the Classroom Environment Study to search for quite straightforward and easily identifiable (from the perspective of the teacher) aptitude-treatment interactions. Level of past achievement would be one such aptitude.

Student characteristics may also influence student engagement on the learning task, and hence the amount of student academic engaged time. Although there is little published research which has investigated this relationship, several student characteristics warrant attention. The first category concerns student affective characteristics and includes interest in the subject matter, academic motivation and expectation of success. It seems likely that each of these affective variables influences the students' willingness to participate in the learning activity. Such a notion is similar to Carroll's construct 'perseverance' (Carroll, 1963). Unfortunately this is a largely unexplored area of classroom research.

Student cognitive characteristics may also affect academic engaged time. They may directly affect academic engaged time by regulating the amount of time required for learning; they may also indirectly affect academic engaged time by influencing student expectation of success and possibly interest in the subject matter. Three cognitive variables are relevant. These are: (1) general aptitude; (2) knowledge of course prerequisites; and (3) prior knowledge of course objectives. Each has been positively and consistently shown to be related to student achievement (Bloom, 1976). Furthermore, student knowledge of course prerequisites has been found to be negatively related to amount of time required for learning (Block, 1970). Students with a sound understanding of course prerequisites need less time to learn specified material. Students who do not possess a sound understanding of the course prerequisites will take longer to learn the material and, in fact, may never learn it. In brief, the material is too difficult. This concept of difficulty level has been further investigated by Berliner and his colleagues (Berliner, 1979). They have argued that the influence of academic engaged time upon student achievement is mediated by the difficulty level of the material to be learnt. This has led them to propose the variable 'Academic Learning Time' which represents the interaction between student engaged time and difficulty level, and which they suggest will be strongly and positively correlated with student achievement (Berliner, 1979).

In also focusing upon the material to be learnt, Doyle (1979) has drawn attention to the structure of classroom tasks and, in particular, academic tasks. Students may differ in their interpretation of the academic tasks presented by teachers. Both interest in the subject matter and subject-matter related knowledge are likely to influence the students' understandings of what academic tasks they are required to undertake. Hence both these student characteristics are likely not only to influence student willingness to engage in the learning task (as already noted) but also the type of learning outcome students might expect to derive from the learning activity.

So far we have considered the direct effect of student cognitive characteristics upon academic engaged time and student achievement. We would expect that such cognitive characteristics might also influence the students' expectations of success. Where the discrepancy between what the student already knows and what he or she is expected to learn is great, student expectation of success will be low. This may, in turn, result in withdrawal from the learning activity, reduced academic engaged time and lower student achievement.

This section has drawn attention to the value of considering several student-related constructs within the instructional model. The first of these is student willingness to participate in the learning activity. The second is the difficulty level which characterizes student-teacher interactions. This will in turn be affected by student ability and student knowledge of certain prerequisite concepts. In addition it would seem useful to examine the influence of certain student characteristics, such as ability and attitude, upon teachers' expectations of student achievement and subsequent instructional and managerial teaching practices adopted in the classroom.

The Context of Teaching and Learning: Summary

Four categories of context variables have been examined in this chapter. These are teacher characteristics, school policy and organization, instructional setting, and student characteristics. Within each category, particular context variables have been considered because research suggests that they may influence teaching practices and, in turn, student learning. It is extremely unlikely that all context variables described above will be important in all classroom settings. Rather it is more likely that some small number will be especially pertinent to a particular setting. Even where the same context variables are related to teaching practices and student learning in a number of settings, we might expect that the strength of individual relationships will differ between settings.

Finally it must be emphasized that it is clearly essential to examine the context of teaching and learning in the Classroom Environment Study. It would be of limited use to identify process-product relationships without reference to the types of educational settings in which the relationships have been observed. The purpose of the Classroom Environment Study must be seen as a means of generating an understanding of process-product relationships as they are influenced by such factors as class size, student ability, and allocated time. All of these factors are readily identifiable characteristics of the educational setting and constitute constraints within which the teacher has to make decisions about the most appropriate teaching strategies for a particular class. By presenting teachers and teacher educators with such knowledge, it is hoped that teachers will be better able to select teaching practices which optimize student achievement and attitude development in specific educational settings.

CHAPTER 3

THE TEACHER SURVEY

A first stage in the Classroom Environment Study was to collect information about contextual influences upon teaching practices, as well as information about the actual teaching practices used by the teachers. This information was to serve several purposes, and these have been discussed in the opening chapter. These purposes may be summarized as:

1 to describe current teaching practices across the educational system;
2 to help interpret process-product relationships which might emerge during subsequent stages of the study;
3 to provide a basis for the selection of teachers (and hence classes) for the correlational study; and
4 to assess the suitability of the proposed instructional model at the system level.

While information of this sort may be collected by visiting a small number of classes and interviewing teachers, the study was more concerned with system-wide teaching practices and context. For this reason a survey of a representative group of teachers within the educational system was undertaken. This chapter deals with the selection of relevant teaching practices and contextual factors, and the development of the survey questionnaire. The next chapter is concerned with the definition of the target population of teachers, the selection of a representative sample of teachers, and the survey procedures used in the collection of information.

The Selection of Relevant Variables

An examination of the research dealing with the context in which learning and teaching occurs suggested that there were many important contextual influences which could be included in a study such as this. As has already been noted, the array of contextual factors reviewed in the previous chapter is far too extensive for any one study to assess their influence. Certain considerations guided the choice of teaching practices and contextual factors to be included in the present study. First, some are more easily measured by questionnaire technique than others. For example, where curriculum practices differ widely within a system, the concept of pacing would be quite difficult to assess by questionnaire. By contrast, classroom structural variables such as class size and student grouping practices are more readily assessed by means of questionnaires.

Secondly, the selection of practices and contextual factors was guided by a fairly simple model of influences upon the teaching process. The model proposed that teachers' attitudes to specific teaching practices and curriculum aims influence the teaching practices they adopt in the classroom. These relationships are also affected by extra-classroom factors and elements of the instructional setting. This model is illustrated in Figure 3.1. The model provided a framework for assembling the information collected in the survey and proposed a number of straightforward relationships to be investigated. Since the overall emphasis in this first stage of the Classroom Environment Study was exploratory, it was not envisaged that a complex and detailed analysis of the proposed model would be carried out, at least not in the first instance. For this reason the factors have been merely grouped within three broad categories and there has been no attempt to integrate them within a structural model.

Year level and subject area constitute important contextual variables in a study of teaching practices. In the survey, the following four types of teaching situations were investigated:

1 the teaching of mathematics to Year 2 students;
2 the teaching of mathematics to Year 5 students;
3 the teaching of mathematics to Year 8 students; and
4 the teaching of science to Year 8 students.

There were two reasons for selecting this set of year levels and subject areas. First, the subject areas of mathematics and science were chosen in order to provide further information which would complement data about each of these subject areas previously collected by the Australian Council for Educational Research. Secondly, the year levels were chosen so as not to include year levels at either the beginning or end of primary or secondary schooling, but still to allow variation in teaching practices attributable to differences in year levels to be recorded.

A broad overview of the categories of teaching practices and contextual factors about which information was sought in the survey has been presented. Three categories were identified: teacher characteristics, mediating influences, and teaching processes. Within each of these general categories further sets of constructs were defined. Three were related to the characteristics of the teacher and concerned attitudes to specific teaching practices, attitudes to curriculum aims, and teaching experience. Four sources of mediating influence were identified and these included teacher autonomy, school aims, and the availability of time and staff assistance for lesson preparation and correction. In addition to these extra-classroom influences, elements of the instructional setting constituted a fourth mediating influence upon the teaching process. Finally, four aspects of the teaching process were defined: two specific teaching practices, assessment procedures, prescription of homework, and the types of instructional materials used.

TEACHER CHARACTERISTIC	MEDIATING INFLUENCE	TEACHING PROCESS
Attitudes to Teaching Practices	Teacher Autonomy	Class Activities
		Instructional Cues
	Aims of School	
Attitudes to Curriculum Aims	Instructional Setting	Assessment Procedures
		Prescription of Homework
Teaching Experience	Allocation of Resources for Lesson Preparation and Correction	Instructional Materials

Figure 3.1 The Model Underlying the Teacher Survey Questionnaire

The Teacher Survey Questionnaire

The Teacher Survey Questionnaire was constructed to obtain information about each of the teaching practices and contextual factors described in Figure 3.1. This section of the report deals with the further definition of each of these teaching practices and contextual factors, in terms of specific variables, and describes the measures developed.

The Teaching Process

A major purpose of the Teacher Survey Questionnaire was to describe the teaching practices adopted by teachers in the four areas identified in terms of the proposed instructional model underlying the study. This instructional model was described in the introductory chapter. Three sets of instructional practices were considered as essential to the model: instructional cues, oral questioning, and feedback and correctives. In addition, a set of teacher management practices was proposed. These sets of teaching practices comprise teaching behaviours which, in the main, are quite specific in nature. The management practices include such specific teacher behaviours as 'correctly identifying the student who was the source of misbehaviour', and 'taking immediate disciplinary action to halt student misbehaviour'. In regard to questioning, quite specific teaching behaviours are also listed: frequency of redirecting questions and frequency of asking questions at different cognitive levels are two examples.

Two points need to be made. First, Evertson et al. (1975) found that teachers' attitudes towards the use of specific teacher behaviours and teachers' estimates of the use of these practices did not correspond to observed use in the classroom. There were several reasons for this disparity. Teachers were asked to analyse their teaching styles within a set of categories which were quite unfamiliar. While the categories of teacher behaviour might have been meaningful to them, they were meaningful in an a posteriori sense and would not constitute a typical means of self-evaluation. In addition, the general pace and pressure of classroom teaching might allow little time for reflection upon one's teaching style.

The second point concerns the obvious desirability of several teaching behaviours in the instructional model. It may be difficult to obtain reliable estimates of the occurrence of those behaviours which clearly differentiate between 'good' and 'bad' teaching. One such example would be 'correctly identifying the student who was the source of misbehaviour'. As a result of both these considerations, the occurrence of only the following teaching behaviours contained in the instructional model were investigated in the survey: instructional cues, feedback and correctives following tests, and the development of a climate of accountability as one particular aspect of teacher management. It was felt inappropriate to seek information concerning oral questioning practices and the remaining teacher management practices. In addition to the measurement of instructional cues and assessment procedures, information was also sought from teachers about the major teaching-learning activities which they used, the extent to which they prescribed homework, and the types of instructional materials they selected.

Teachers could have been asked to report upon the teaching practices they adopted throughout the entire school term, during a specific school week, or in the last lesson before completing the questionnaire. In the Teacher Survey Questionnaire teachers were asked to indicate their teaching methods in the last five school days before responding to the questionnaire. This seemed a satisfactory amount of time from which to generalize more widely. It also provided the teachers with a recent and specific period of time upon which to base an assessment of their teaching. In the following sections the teaching practices examined in this study are considered in greater detail.

1 Instructional cues

Instructional cues define for the students what is expected to be done during the lesson and what knowledge and skills are to be learnt. Sources of instructional cues include the teaching materials used, the teacher's lesson introduction and summary, and the students' involvement in tests, short quizzes and verbal questioning during the lesson. Teachers were asked to indicate the extent to which each of these four possible sources served as instructional cues for their students.

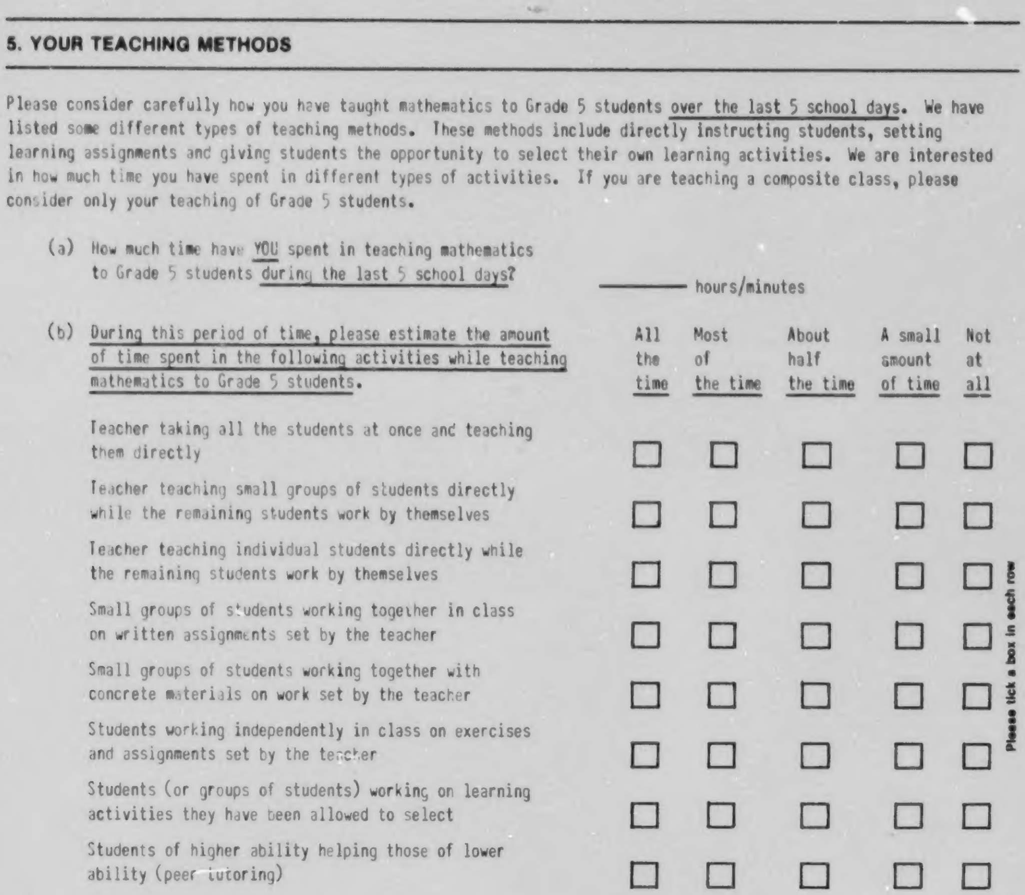
2 Feedback and correctives

Feedback and correctives follow both informal teacher-student interaction: for example, questioning and more formal assessment procedures such as tests and examinations. In the survey it was felt appropriate only to focus upon the latter. This also enabled some estimation of the climate of accountability developed in classrooms. Formal assessment methods may either involve the assignment of marks and course grades to students based upon their level of understanding of work or they may be used for diagnostic purposes to assess student weaknesses without the subsequent allocation of marks or course grades. Apart from the overall purpose of assessment, the frequency of such testing is also an important consideration. Assessment procedures suggested by Bloom (1976) consist of short formative tests at the conclusion of each learning unit, rather than tests or exams at longer intervals as is often the case in schools. Also of particular interest is whether instructional practices follow immediately after the students' completion of either type of assessment. For example, studies dealing with mastery learning have stressed the benefits of providing specialized instruction on those concepts and skills missed by students in tests and exams, before students continue with the next stage of their work. In brief, there are three aspects of student assessment which are important: the purpose of assessment, the frequency of assessment, and the corrective procedures adopted following assessment. Each was measured in the Teacher Survey Questionnaire.

3 Class activities

A second group of teaching processes which concern more global teaching-learning activities was also investigated in the study. While this set of teaching processes is not central to the instructional model specified, its importance to the study has already been noted. These class activities are primarily defined by the role adopted by the teacher and the number of students involved in the activity. Teachers can directly instruct their students in such a way that the teacher defines the instructional goals, selects the instructional materials and controls the pace of the lesson. This has been referred to as direct instruction (Rosenshine, 1979). Alternatively the teacher may adopt a watching, helping role so as to facilitate student learning rather than actively direct it. This teaching style can be described as learner-centred and non-directive. Apart from the role adopted by the teacher in an activity, the teacher may decide to involve the entire class, a group of students within the class, or individual students separately.

Information about class activites relating to the above-mentioned characteristics was obtained through the questionnaire. In addition, it was of interest to seek more detailed information about the type of group work carried out in class. For example, while there has been a recent trend in the teaching of science to emphasize practical work undertaken by small groups of students, groups of students may also work together on written assignments or spend time discussing problems and other curriculum-related issues. Finally, information was sought concerning the extent to which students (or groups of students) were able to choose their own learning activities and the extent to



5. YOUR TEACHING METHODS

Please consider carefully how you have taught mathematics to Grade 5 students over the last 5 school days. We have listed some different types of teaching methods. These methods include directly instructing students, setting learning assignments and giving students the opportunity to select their own learning activities. We are interested in how much time you have spent in different types of activities. If you are teaching a composite class, please consider only your teaching of Grade 5 students.

(a) How much time have YOU spent in teaching mathematics to Grade 5 students during the last 5 school days?

_______ hours/minutes

(b) During this period of time, please estimate the amount of time spent in the following activities while teaching mathematics to Grade 5 students.

	All the time	Most of the time	About half the time	A small amount of time	Not at all
Teacher taking all the students at once and teaching them directly	☐	☐	☐	☐	☐
Teacher teaching small groups of students directly while the remaining students work by themselves	☐	☐	☐	☐	☐
Teacher teaching individual students directly while the remaining students work by themselves	☐	☐	☐	☐	☐
Small groups of students working together in class on written assignments set by the teacher	☐	☐	☐	☐	☐
Small groups of students working together with concrete materials on work set by the teacher	☐	☐	☐	☐	☐
Students working independently in class on exercises and assignments set by the teacher	☐	☐	☐	☐	☐
Students (or groups of students) working on learning activities they have been allowed to select	☐	☐	☐	☐	☐
Students of higher ability helping those of lower ability (peer tutoring)	☐	☐	☐	☐	☐

Please tick a box in each row

Figure 3.2 Item Examining the Extent to which Teachers Use Eight Types of Classroom Activity

which higher-ability students assisted in the teaching of lower-ability students. Both these latter types of class activities are indicative of learner-centred teaching styles.

The question on the Teacher Survey Questionnaire which examined the amount of time spent during lessons in each of these types of activities during the teaching of mathematics at each of the three year levels under study is presented in Figure 3.2. Minor modifications were made so that it was also appropriate for use in the survey of science teaching practices.

In this section of the questionnaire teachers were asked to indicate how much time they had spent in teaching the particular subject area under investigation during the previous five school days. The purpose of this item was to examine the extent to which class allocated time differed from actual instructional time.

6. THE TYPES OF TEACHING MATERIALS YOU USE

In this section of the survey we are interested in the teaching materials you use in teaching Grade 5 maths.

To what extent over the last 5 days have you used the following teaching materials?	All the time	Most of the time	About half the time	A small amount of time	Not at all	Item not available
Text-books such as 'Continuous Progress in Mathematics'	☐	☐	☐	☐	☐	☐
Curriculum packages such as IMP (Individual Mathematics Program)	☐	☐	☐	☐	☐	☐
Teaching materials such as fraction kits, MAB blocks and measuring blocks	☐	☐	☐	☐	☐	☐
Worksheets and assignments prepared by the teacher	☐	☐	☐	☐	☐	☐
To what extent over the last 5 days have you used the following teaching aids?						
Chalk board and overhead projector	☐	☐	☐	☐	☐	☐
Mathematical posters and displays	☐	☐	☐	☐	☐	☐
Television, radio and film	☐	☐	☐	☐	☐	☐

Please tick a box in each row

Figure 3.3 Item Examining the Extent to which Teachers Use Seven Types of Instructional Materials

4 Instructional materials

An integral part of a teaching activity is the instructional material selected by the teacher. There are many instructional materials available in each of the subject areas and at the year levels being investigated in the Classroom Environment Study. These materials include:

1. text books such as 'Continuous Progress in Mathematics';
2. curriculum packages such as 'Individual Mathematics Program';
3. concrete teaching materials such as fraction kits, MAB blocks and measuring blocks;
4. mathematics worksheets prepared by the teacher; and
5. mathematics posters, displays and films.

In addition, there are several more general instructional materials, or resources, available for use by the teacher in conjunction with these subject-specific materials. These include the chalkboard and overhead projector.

Similar materials are available to science teachers, although laboratory equipment used in practical lessons is often of a more general nature than materials such as fraction kits used in mathematics teaching. Science teachers at the Year 8 level may also utilize single-theme written materials for the purposes of instruction. These are usually not available for the teaching of specific mathematics topics.

A sample of the items in the questionnaire which collected information about the types of teaching materials used by mathematics teachers is presented in Figure 3.3. It should be noted that teachers were given the opportunity to indicate whether the teaching materials listed were unavailable.

5 Homework

The final aspect of the teaching practices which was investigated in the survey concerned the setting of homework. Teachers in each target group were asked whether they set homework and, if so, how much homework they had set over the previous five school days. Teachers who had not set homework during this period were asked whether they believed homework should be set for students in that particular class.

The Teaching Process: Summary

Information concerning practices employed in the teaching of mathematics and science was collected by means of the Teacher Survey Questionnaire. This information centred upon the teachers' presentation of instructional cues, the types of assessment procedures used including feedback and correctives, the amount of time spent in different teaching-learning activities, the types of instructional materials selected by teachers and, finally, the setting of homework. The teaching process variables measured in the survey are summarized in Table 3.1.

One of the limitations of survey research in the area of teacher effectiveness is that detailed information cannot easily be obtained and that issues of interest cannot be extensively explored. For example, it would have been of interest to know why homework was not set by those teachers who believed that it should be set. It would also have been desirable to seek more extensive knowledge of the grouping practices employed, including more precise knowledge of their composition in regard to ability level. Unfortunately the number of questions one could reasonably expect teachers to complete restricted the collection of such detailed and valuable information.

Teacher Characteristics

In the first set of contextual factors investigated in the study were the following teacher characteristics: attitudes to specific teaching practices, attitudes to curriculum aims, and background characteristics. There were several reasons for their inclusion. Each of these teacher characteristics may influence teaching practices used by teachers and hence may influence the widespread implementation of the proposed instructional model underlying the Classroom Environment Study. Measurement of teachers' attitudes to

Table 3.1 Teaching Process Variables Measured in the Teacher Survey Questionnaire

Teaching practices	No. of categories
Instructional cues	
reading texts, exercises and worksheets	4
teacher definition of lesson objectives	4
teacher summary	4
tests and verbal questioning	4
Assessment methods	
frequency of assessment testing	5
major type of assessment procedure	4
frequency of diagnostic testing	5
corrective procedures	3
Class activities	
whole class instruction	5
small group instruction	5
individual student instruction	5
group work - written assignments	5
group work - concrete materials	5
group work - discussion (Year 8 Science only)	5
student independent work	5
student selection of activities	5
peer tutoring	5
Instructional materials	
text books	6
curriculum packages	6
concrete teaching materials/laboratory equipment	6
teacher-prepared worksheets and assignments	6
single theme materials (Year 8 Science only)	6
chalkboard and overhead projector	6
posters and displays	6
television, film and radio	6
Prescription of homework	
the prescription of homework	Yes/No
amount of homework set	in hours/minutes
the belief that homework should be set	Yes/No

curriculum aims also served another purpose. It suggested the relative emphases to be adopted in the construction of outcome or product measures.

1 Attitudes to specific teaching practices

Two approaches to the measurement of attitudes to teaching practices have been described in the second chapter. The first approach considered the teachers' attitudes to distinct teaching styles (Ashton et al., 1975; Bennett, 1976). Alternatively, teachers' attitudes about specific teaching behaviours were sought by Evertson et al. (1975). The first approach asked teachers to comment upon quite general approaches to teaching;

the second required teachers to consider highly specific aspects of teaching. The types of teaching practices the teachers in the survey were asked to comment upon fell midway between these. The selected behaviours were derived primarily from the proposal and the instructional model implicit in it. In addition, a small number of teacher behaviours were included which were derived from a study of science teaching by Eggleston, Galton and Jones (1976). These teacher behaviours are not part of the management and instructional variables considered in the model but they do refer to other aspects of the teaching process which may be of interest, particularly in the area of science teaching. For example, the theoretical-practical dimension of teaching is typically more pertinent to science classes than it is to mathematics classes.

Teachers in the survey indicated their preferred methods of teaching in relation to 12 teaching practices. Actual teaching practices are often influenced by constraining factors such as lack of resources and heavy teaching loads. Therefore teachers were asked to suppose they were given the opportunity to teach, without any of these restrictions, the same topics to the same class upon which earlier responses in the questionnaire were based. This was necessary as teachers hold attitudes about the relevance of certain teaching practices to the whole curriculum on a particular subject and to specific topics within the curriculum. These may not be the same.

This question in the Teachers Survey Questionnaire for the teachers of mathematics is included in Appendix I. Only minor modification was required for its inclusion in the survey of science teaching.

2 Attitudes to curriculum aims

There are several types of information concerning teachers' attitudes to the aims of the curriculum which can be sought. The first is quite general and is applicable across different subject areas. For example, one could ask teachers to indicate their attitudes to the following aims and the extent to which they influence their teaching:

(a) an understanding of the world in which students live;
(b) knowledge of the basic concepts and skills in the curriculum;
(c) the development of creativity and self-expression; and
(d) an enjoyment of the curriculum.

Another quite general approach was used by Piper (1978) in his study of social learning. Emphases between the content of learning, the process of learning and the context in which learning takes place were differentiated.

The second type of information concerns teachers' attitudes to the specific aims of the particular curriculum being taught. In the case of mathematics curricula the following aims would be relevant:

(a) basic skills in computation and use of common measures;
(b) knowledge of mathematical terms;
(c) understanding relationships of space, quantity and number;
(d) knowledge of the nature of mathematical investigation and reasoning;
(e) awareness that mathematics is useful in everyday life;
(f) an ability to apply mathematical ideas and skills to real-life situations; and
(g) an ability to show flexibility, fluency and originality in thinking in mathematics related situations.

These aims are typical of those underlying current mathematics curricula used in Victorian primary and lower secondary schools (see, for example, Jeffery, 1975). This second approach to the assessment of teachers' attitudes to curriculum aims was adopted in the present study. Mathematics teachers were asked to indicate the extent to which each of these curriculum aims influenced their teaching of mathematics.

An appropriate set of aims of science education was compiled from an examination of the curriculum materials of the Australian Science Education Project (ASEP, 1974) and from Fensham (1980). Science teachers were asked to comment upon the relative influence of the following aims upon their teaching:

(a) basic knowledge about a wide range of scientific concepts;
(b) understanding relationships concerning man and both the physical and biological environment;
(c) knowledge of the nature of scientific investigation and reasoning;
(d) skills in practical investigation, including use of laboratory equipment;
(e) development of an understanding of the social implications of science;
(f) an ability to apply scientific ideas and skills to real life situations; and
(g) an ability to show flexibility, fluency and originality in thinking about science-related issues.

The type of response sought from teachers in regard to this item requires comment. During the trial of the questionnaire, teachers were asked to indicate the relative importance of these aims to their teaching on a 5-point scale, ranging from 'very important' to 'not important'. Many teachers failed to differentiate between the aims, marking all as being important influences upon their teaching. In the final form of the Teacher Survey Questionnaire teachers were asked to indicate the two aims which most influenced their teaching and the two aims which least influenced their teaching of the curriculum. The importance of all aims was acknowledged in the stem of the item.

3 Background teacher characteristics

Rather than request a wide range of biographical information about the teachers in the sample, it was decided to limit the information sought to three background characteristics of each teacher. These were:

(a) total length of teaching experience;

(b) length of teaching experience in the relevant subject area and at the relevant year level; and

(c) length of teaching experience in current school.

Teacher Characteristics: Summary

Information was sought from teachers about their attitudes to 12 teaching practices and to a set of seven curriculum aims which were directly relevant to the curriculum they taught. Information about their teaching experience was also sought. The teacher characteristics variables measured in the survey of Year 2, 5 and 8 mathematics teachers are summarized in Table 3.2. Only slight changes were made in the case of Year 8 science teachers.

Mediating Influences upon Teaching Practices

Four sets of possible mediating influences upon teaching practices adopted by teachers were investigated in the Teacher Survey Questionnaire. In the model described in Figure 3.1, these factors were considered to have important effects upon the relationship between teacher characteristics and the teaching process. The factors concerned teacher autonomy in the school, the educational aims of the school, elements of the instructional setting, and the allocation of resources to teachers for lesson preparation and correction.

1 Teacher autonomy

School policy relating to the autonomy of teachers determines the extent to which teachers are free to make decisions about particular educational practices. The survey examined teacher autonomy in regard to:

(a) the selection of topics to be taught;

(b) the selection of instructional materials;

(c) the sequence of learning units to give to students;

(d) the types of teaching practices to use;

(e) the use of achievement tests in class; and

(f) the specification of minimum performance standards before students can progress to the next level of work.

Teachers indicated on a four-point scale, ranging from 'fully' to 'not at all', the extent to which they were free as individual teachers to decide about these aspects of their teaching.

Table 3.2 Teacher Characteristic Variables Measured in the Teacher Survey Questionnaire

Teacher characteristics	No. of categories
Attitudes to teaching practices	
clearly defining what is to be learnt	4
diagnostic testing at the end of each topic	4
using a wide range of concrete materials	4
using written instructional materials	4
instructing students individually	4
setting practice exercises	4
setting 'higher-order' exercises	4
student selection of activities	4
whole class instruction	4
testing and grading students	4
setting of 'off-task' activities	4
group work	4
Attitudes to curriculum aims - Mathematics[a]	
basic skills in computation and use of common measures	M/L
knowledge of mathematical terms	M/L
understanding relationships of space, quantity and number	M/L
knowledge of the nature of mathematical investigation and reasoning	M/L
awareness that mathematics is useful in everyday life	M/L
ability to apply mathematical ideas and skills to real-life situations	M/L
ability to show flexibility, fluency and originality in thinking in mathematics-related situations	M/L
Attitudes to curriculum aims - Science	
basic knowledge about a wide range of scientific concepts	M/L
understanding relationships concerning man and both the physical and biological environment	M/L
knowledge of the nature of scientific investigation and reasoning	M/L
skills in practical investigation, including use of laboratory equipment	M/L
development of an understanding of the social implications of science	M/L
ability to apply scientific ideas and skills to real-life situations	M/L
ability to show flexibility, fluency and originality in thinking about science-related issues	M/L
Teaching experience	
total length of teaching experience	Years
length of teaching experience in the relevant subject area and at the relevant grade level	Years
length of experience in current school	Years

Note: [a] Two aims identified as M - Most, and two identified as L - Least.

2 Aims of the school

In the main, the aims of Australian schools are extremely varied and usually expressed in quite general terms. Often they do not refer to specific subject matter but focus upon the future development of students, especially as they take their place in society after leaving school. Ashton et al. (1975) produced two broad school aims to describe the functioning of primary schools.

(a) The purpose of primary education is to begin to equip the child with skills and attitudes which will enable him to take his place effectively and competently in society, fitting him to make a choice of an occupational role and to live harmoniously in his community.

(b) The purpose of primary education is to foster the development of the child's individuality and independence, enabling him to discover his own talents and interests, find a full enjoyment of life in his own way, and arrive at his own attitudes towards society.

Both these aims appeared suitable for the Teacher Survey Questionnaire. Teachers in each target group were asked to indicate the relative emphasis their school adopted in terms of both these stated aims. Teachers were also asked to indicate the relative emphasis which they believed should be given to each.

3 Elements of the instructional setting

There were four major elements of the instructional setting which were considered. The first was concerned with the class being taught and, more precisely, the composition of the class in terms of its size, ability level and year level. The second aspect of the instructional setting was the teaching arrangements for the particular class in which the teacher was working. The third element referred to both the amount of allocated time for the subject being studied at the year level, and the distribution of this time. The final element consisted of the topics being taught at the time of the survey.

Class size and composition. In a substantial number of Australian primary schools, classes are composed of students drawn from several year levels. These are commonly referred to as composite classes. Teachers of Year 2 and 5 classes in the sample were asked to indicate the year level composition of their student groups. They were then requested to indicate the number of students they taught at the target year level under survey, and, if a composite class, the total number of students in the class group. Finally information about the ability level of each class was sought. Teachers were asked to indicate whether, in their opinion, the students in the class were about the same ability, of higher ability, or of lower ability than most students in the age group. The phrase 'in your opinion' was included to emphasize that only a subjective assessment of student ability was expected. The Teacher Survey Questionnaire directed to teachers of

Year 8 mathematics and science classes did not include questions concerning year level composition of the class.

Teaching arrangement. There is a wide variety of teaching arrangements currently being used in Australian primary and secondary schools. Apart from the more traditional one-teacher/one-class teaching situation, team teaching is also practised. Team teaching refers to more than one teacher taking the class for a particular subject, either at the same time or at different times. In addition, specialist teachers may teach individual students from the class at various times, often for remedial purposes. The occurrence of each of these teaching arrangements was investigated in the Teacher Survey Questionnaire.

Allocated time. Information about the amount of time allocated each week to the class for studying the particular subject was requested. In addition teachers were asked to state, on average, how many teaching sessions were included in this allocated time. The number of teaching sessions referred to the number of times in the week that teachers were involved in teaching the class. It did not refer to the number of periods, a term commonly used at the secondary school level. Therefore sessions could have been of differing time duration for the same class across a school week.

Topics. The fourth element of the instructional setting investigated in the survey was the subject matter being taught at the time of the survey. Teachers were asked to list the topics they had been teaching to their class during the five school days prior to the completion of the questionnaire.

The purpose of this item was twofold. First, it focused the teachers' attention upon their teaching of specific lessons when answering the questionnaire. Secondly, it enabled an estimation to be made of the variety of topics taught during a school week at the different year levels and, in the case of the secondary school sample, across subject areas. This was particularly important for the planning of the subsequent stages of the Classroom Environment Study. It must be emphasized that this item was not designed so as to produce a detailed analysis of the curriculum being taught at the time of the survey. Such an aim would have required a more extensive set of questions.

4 Resource allocation for lesson preparation and correction

Help from ancillary staff may be available to teachers to assist them in lesson preparation and correction. Furthermore teachers may be allocated in their timetable a set amount of time for this purpose. Both aspects of resource allocation were considered in the Teacher Survey Questionnaire.

There are two components of the teacher's time which must be taken into consideration. The first is the amount of instructional time and is usually equal to the time allocated in the school or class timetable. The second is the amount of time the teacher spends preparing lessons and correcting work outside the formal lessons in which the curriculum is taught. This latter time can be spent before and after the normal school hours, during lessons in other subject areas, or at home. In addition, there may be time during the school day which is not allocated in the school timetable to teaching and specific non-teaching duties such as sport supervision and pastoral care. These amounts of time are commonly referred to as 'spare' periods and are available for lesson preparation and correction.

Information about each of these aspects of lesson preparation and correction time was sought. The items included in the questionnaire are given below.

(a) How much time per week in a teacher's timetable is not allocated to teaching and specific non-teaching duties such as sport, but is available for lesson preparation and correction? Lunchtime, assembly time and staff meeting times are not to be included.

(b) How much time per week is spent by teachers during lessons (not 'spare' periods) in lesson preparation and correction?

(c) How much time per week is spent by teachers outside normal hours in lesson preparation and correction?

Each of these questions referred to the amount of time spent in lesson preparation and correction for all subject areas taught. Teachers were then asked to indicate what fraction of this total time was spent in lesson preparation and correction for the specific class or subject being studied in the survey.

Teachers in schools sometimes have access to help from ancillary staff for the preparation of materials. Teachers in certain subject areas may also be helped by specialist assistants. The availability of a laboratory assistant for science teachers would be one such example. Teachers were asked whether they usually made use of both these forms of staff assistance for the preparation of materials. Teachers who indicated that they did not make use of this type of assistance were given the opportunity to indicate whether or not such assistance was available.

Mediating Influences: Summary

The Teacher Survey Questionnaire included questions concerning four sets of mediating influences upon possible relationships between teacher characteristics and teaching practices. The first set dealt with the extent to which teachers in the sample were free to select the topics they taught, the instructional materials they used, the teaching practices they adopted and the assessment procedures they used in class. The second set was concerned with the educational aims of the school and the relevant item was designed so as to enable the assessment of the agreement between school and teacher aims. The third set of mediating influences focused upon four elements of the

Table 3.3 Mediating Variables Measured in the Teacher Survey Questionnaire

Mediating influences	No. of categories
Teacher autonomy	
selection of topics for teaching	4
selection of instructional materials	4
sequence of learning units to give to students	4
types of teaching practices to use	4
use of achievement tests in the class	4
specification of minimum requirement for student progression	4
Aims of the school	
role in society of the student	0-5
development of student individuality	0-5
Instructional setting	
year-level composition of class (Years 2 and 5 only)	4
number of students in class at relevant year level	No
total number of students in class (Years 2 and 5 only)	No
ability level of students in class	3
teaching arrangement	3
allocated time	hours/minutes
number of teaching sessions per week	No
topics	various
Resource allocation - ancillary staff	
laboratory assistant (Year 8 science only)	3
general ancillary staff	3
Resource allocation - time	
amount of allocated preparation time	5
proportion of allocated preparation time spent in preparation for specified class	4
amount of preparation time during lessons	6
amount of preparation time outside school hours	6
proportion of non-allocated preparation time spent in preparation for specified class	4

instructional setting: class size and student composition, teaching arrangement, allocated time, and topics taught. Resource allocation for lesson preparation and correction was the final mediating influence measured in the Teacher Survey Questionnaire. The four sets of mediating variables measured in the Teacher Survey Questionnaire are summarized in Table 3.3.

CHAPTER 4

TEACHER SAMPLES AND SURVEY ADMINISTRATION

The Teacher Survey Questionnaire was developed to seek information about the teaching of mathematics and science from teachers working in Victorian schools. The purpose of this chapter is to define the population of teachers for whom the questionnaire was developed, to describe the sampling procedures adopted for the selection of teachers for each sample, to describe the methods employed for the administration of the survey and, finally, to outline the procedures used in data preparation prior to analysis.

The Population of Teachers Studied

One of the important aims of the survey phase of the Classroom Environment Study was to examine year level and subject area differences in the types of teaching practices adopted by teachers. It was considered advantageous to maximize the variety of teaching practices characterizing each year level and subject area, if possible. There was likely to be greater heterogeneity of teaching practices exhibited across sectors of the educational system than within a particular sector. Therefore, it was decided to include teachers from government schools, Catholic schools and independent schools in the target populations.

The next decision in the definition of the target populations for the survey was the designation of appropriate year levels and subject areas. Years 2, 5 and 8 and the subject areas of mathematics and science were selected. The reasons for the selection of these grade or year levels and subject areas have already been discussed in the previous chapter. As a result of both these considerations, the following four target groups were defined:

Population 1: all Year 2 teachers teaching in normal Victorian primary schools at the time of the survey who included in their teaching program the teaching of mathematics.

Population 2: all Year 5 teachers teaching in normal Victorian primary schools at the time of the survey who included in their teaching program the teaching of mathematics.

Population 3: all teachers teaching in normal Victorian secondary schools at the time of the survey who included in their teaching program the teaching of mathematics to Year 8 students.

Population 4: all teachers teaching in normal Victorian secondary schools at the time of the survey who included in their teaching program the teaching of science to Year 8 students.

A number of comments are required. First, the proposed date for the administration of the survey corresponded to the 1980 third school term. Therefore each target population consisted of all those teachers who in the third school term of 1980 taught at the year level and in the subject area specified. Secondly, schools were included which belonged to the government, Catholic and independent sectors of the Victorian education system. Thirdly, secondary schools included both schools oriented towards a technical education and those oriented towards a more general education. The former comprised technical schools, technical high schools and technical colleges; the latter group comprised high schools and colleges. Finally, the number of teachers in each of these populations was not available. This last point meant that combined analyses of data collected from the four target samples were limited.

The Sampling of Teachers

The sampling design for the present study was based upon that used in the Staffing and Resources Study (see Ainley, 1982). The target populations for the Staffing and Resources Study did not consist of teachers. Rather four target populations of schools were identified. Therefore there were three differences between the populations characterizing each study. These were the elements defining the populations (schools in one study and teachers in the other), the types of schools relevant to the populations (government schools in one study; and government, Catholic, and independent schools in the other) and finally the breadth of coverage of the populations (Australia and New Zealand in one study and Victoria only in the other).

Notwithstanding these differences it was decided to select each of the four samples of teachers for the Classroom Environment Study so as to include teachers of all Victorian schools selected for the Staffing and Resources Study. A stratified probability sampling procedure was used in this latter study. In the case of both primary and secondary schools, the sampling frame currently used by the Australian Council for Educational Research stratifies schools firstly into state systems and then into government, Catholic, and independent school sectors. At a third level of stratification, government primary schools are grouped into three sub-strata according to their total student enrolment. In the case of the Victorian government secondary schools, schools are divided into two sub-strata according to whether they are high schools or technical (and technical high) schools. Within each sub-stratum, schools are listed in order of postcode and alphabetically within postcodes. The advantage of stratifying schools in this manner is that it increases the precision of the estimates made from the data collected.

The sampling of schools for the Staffing and Resources Study was performed so that each school had a probability of selection proportional to size. For the primary school sample, the schools were selected with a probability proportional to the number of 10-year-old students in the school. For the secondary school sample, the schools were selected with a probability proportional to the number of 14-year-old students in the school. This means that a simple random sample of schools at each level was not drawn but rather a random sample of schools in proportion to the number of students they served was chosen. By first stratifying schools in the manner described above and then applying probability proportional to size sampling within strata, sound samples of government primary and government secondary schools were produced.

For the Classroom Environment Study it was decided to double the number of government schools in both primary and secondary school samples and to extend each sample so as to include Catholic and independent schools. This was achieved by halving the sampling interval used in the sampling of schools for the Staffing and Resources Study, and then applying that constant interval to schools in all three educational sectors. This procedure resulted at the primary school level in the selection of 98 government schools, 26 Catholic schools and six independent schools. Of these schools 56 government schools corresponded to those selected in the Victorian sample for the Staffing and Resources Study. The reason why the number of corresponding government schools was not 49 (i.e. 98/2) was that the Staffing and Resources Study oversampled small schools so as to include a sufficient number for the purposes of independent analyses.

The secondary school sample for the Classroom Environment Study comprised 69 government high schools, 30 government technical schools, three government higher-elementary and central schools, 23 Catholic schools and 12 independent schools. This sample included all of the 35 government high schools, 15 government technical schools and two higher-elementary schools selected in the Victorian sample of secondary schools for the Staffing and Resources Study.

A summary of the samples of schools selected for the survey phase of the Classroom Environment Study is presented in Table 4.1.

The Staffing and Resources Study was interested in schools, and hence sample selection necessitated only a one-stage sampling procedure. The Classroom Environment Study survey was concerned with teachers and the target populations were defined in terms of teachers. A second stage of sampling was therefore required. Typically this second stage of sampling would involve a random sampling of teachers, the same number being selected from each school chosen at the first stage. This was not the procedure followed in the present study. All teachers from each of the schools selected at the first stage constituted the target sample of teachers for each of the four populations under study. To compensate for the oversampling of teachers from larger schools, the sets of teacher data were weighted in such a way that the same number of teachers from each school contributed data for analysis. This weighting procedure is discussed in a later

Table 4.1 The Number of Schools Selected from Each Stratum in the Samples for the Classroom Environment Study and the Staffing and Resources Study

Type of school	No. selected in the Classroom Environment Study	No. selected in the Staffing and Resources Study
Primary school sample		
Government Stratum 1[a]	43	22
Stratum 2	42	21
Stratum 3	13	13
Catholic	26	-
Independent	6	-
Secondary school sample		
Government High	69	35
Technical	30	15
Higher-elementary	3	3
Catholic	23	-
Independent	12	-

[a] Stratum 1: Special class schools — larger schools
Stratum 2: Class 1 schools
Stratum 3: Class 2, Class 3 schools — smaller schools

section. For the present, the methods used to identify the teachers in the four target samples require some explanation.

All Year 2 and Year 5 class teachers in the primary schools selected at the first stage of sampling made up the Population 1 and Population 2 samples. It was assumed that all class teachers at the primary school level included in their teaching program the teaching of mathematics. The procedure used for identifying teachers in the samples differed according to the type of school in which they taught. In the case of teachers working in government schools, staff lists returned to the Victorian Education Department were examined. Those teachers listed as teaching Year 2 or Year 5 were identified by name. The staff lists referred to staffing arrangements as at March 1980, and only a small disparity between these arrangements and those likely to have existed in the third school term, at the time of the proposed survey, was expected. Similar staff lists were not available from the Catholic Education Office. Therefore the principals of Catholic schools selected at the first stage of sampling were asked to send lists of Year 2 and Year 5 teachers who included in their teaching program the teaching of mathematics. Of 26 schools selected at the first stage, 25 schools returned the required staff list. The same procedure was used for identifying teachers of Year 2 and Year 5 in the independent school sample. Staff lists were received from five out of six independent schools selected. During this period two government schools withdrew from the study.

In this way samples of teachers of Years 2 and 5 were selected for the survey stage

Table 4.2 Number of Teachers in the Year 2, Year 5 and Year 8 Samples According to the Type of School in which They Taught

Category of school	Year 2 sample (N=313)	Year 5 sample (N=322)	Year 8 maths sample (N=528)	Year 8 science sample (N=418)
Primary schools				
Government	263	265		
Catholic	43	48		
Independent	7	9		
Secondary schools				
Government			285	222
Government technical			138	116
Catholic			67	49
Independent			38	31

of the Classroom Environment Study. Table 4.2 summarizes the number of teachers representing each category of school in the two samples.

The identification of Year 8 mathematics and science teachers in each of the secondary school samples followed a similar procedure. However, staff lists of sufficient detail were only available for the high school sample. From 23 Catholic schools requested to return staff lists, 22 staff lists were received in time for the administration of the survey. One independent college was unable to assist in the study and was replaced by a comparable college. Four technical schools were also unable to assist and these too were replaced. The number of teachers from each category in the Year 8 mathematics and Year 8 science samples are presented in Table 4.2. One further comment is required. In many schools teachers of mathematics also teach science, and vice versa. In the case of the small proportion of teachers who taught both subjects at the Year 8 level, half were randomly assigned to the mathematics sample and the remaining half to the science sample. These teachers were therefore requested to complete only one questionnaire.

The Teacher Samples: Summary

Target samples of teachers were selected to represent each of the four defined populations. The teacher populations were defined in terms of year level and subject area of classes taught. A two-stage sampling procedure was adopted. The first stage consisted of a selection of schools using a stratified proportional sampling design. The second stage selected all teachers at the relevant year level and subject area in schools chosen at the first stage. Therefore the four samples of teachers selected did not constitute four simple random samples of teachers, rather they consisted of four samples of teachers belonging to a random sample of schools chosen in proportion to the number of students they served.

Table 4.3 A Summary of the Response Rates to the Teacher Survey Questionnaire for the Four Teacher Samples

				Response rates after			
Teacher sample	Total posted	Not eligible	Target sample of teachers	Initial contact (%)	First reminder (%)	Second reminder (%)	Achieved sample of teachers
Year 2	313	22	291	37.8	64.9	79.4	231
Year 5	322	27	295	32.2	63.7	78.6	232
Year 8 maths	528	11	517	39.1	63.2	83.6	432
Year 6 science	418	16	402	42.0	64.4	85.1	342
Overall sample	1581	76	1505	38.3	64.0	82.2	1237

Administration of the Survey

Prior to the administration of the survey to teachers, all principals were provided with the opportunity for their schools to decline from participating in the study. As has already been noted several did, where possible these schools were replaced with an equivalent school obtained as the next school listed on the sampling frame.

Teachers were identified by name from the staff lists supplied either from the Victorian Education Department or from the school principals. Since teacher names were available, teachers in the sample received, through the mail at their school, personal letters seeking their assistance in the study. This 'direct-to-teacher' mailing procedure reduced the amount of administrative work required by the school to granting permission and to supplying only the initial return of the staff lists which were necessary to identify the teachers in the sample. In the case of government primary and secondary high schools, even this latter administrative requirement was eliminated.

The mailing procedure adopted for the administration of the survey was as follows. First, a numbered questionnaire together with a letter explaining the purposes of the Classroom Environment Study was sent directly to each teacher in the sample. These letters were mailed to the teachers at their respective schools. Ten days after the questionnaires were mailed to teachers, all non-respondents received a follow-up letter reminding them to complete the questionnaire. Ten days later a second reminder letter together with another questionnaire, bearing the same number of the first, was mailed to teachers who had still failed to respond.

1 Teacher responses rates

Throughout the course of the administration of the survey, a small number of teachers notified the Australian Council for Educational Research that their teaching allotment had changed since the time when the staff lists had been compiled. Where possible these teachers were replaced in the sample by the teachers who took over their teaching

Table 4.4 Response Rates for each Teacher Sample According to Category of School in which the Teachers Worked

Category of school	Year 2 sample (%)	Year 5 sample (%)	Year 8 maths sample (%)	Year 8 science sample (%)
Primary school				
Government	76.0	75.0		
Catholic	100.0	91.3		
Independent	57.0	100.0		
Secondary school				
Government high			82.9	86.4
Government technical			85.3	80.0
Catholic			71.0	80.6
Independent				
Overall sample	79.4	78.6	83.6	85.1

responsibilities for the year level and subject area under survey. However, this was not always possible. The number of teachers who were ineligible to complete the questionnaire because of initial incorrect identification, changed teaching allotment, or taking of leave entitlements has been noted in Table 4.3.

Table 4.3 also summarizes the response rates during the period while the survey was being administered. Response rates were calculated in terms of the total number of teachers in the target sample who were eligible to complete the questionnaire. The response rates for all target groups were quite satisfactory, and the overall response rate of 82.2 per cent for the total sample of teachers was well above that generally reported for teacher surveys.

It is also of interest to examine the response rates to the Teacher Survey Questionnaire according to the category of schools in which the teachers worked. Table 4.4 presents this information. Only one response rate was substantially lower than the overall response for each sample, namely the response rate for the independent school sample of Year 2 teachers. However, an inspection of Table 4.2 indicates that only a small number of teachers from this category of schools was originally sampled. Such a low response was not likely to alter markedly the overall description of teaching practices adopted by Population 1 teachers and derived from the present study.

2 Response rates at the school level

A second way to consider the response to the survey is to examine the response rates in terms of schools. The question asked then becomes: Of the total number of schools represented in the teacher sample, how many were represented in the set of questionnaires returned by teachers?

Consider the Year 2 sample of teachers. A total of 130 schools were chosen at the first stage of sampling. Subsequently two government schools declined to assist in the survey. In addition one Catholic school and two independent schools selected did not include in their teaching program the teaching of Year 2 students. As a result 125 schools were represented in the sample of Year 2 teachers to whom questionnaires were sent. From these schools 231 teachers returned questionnaires and a total of 108 schools were represented. Teachers from 17 schools did not contribute any information about their teaching practices. It is important to examine the categories of schools in which these teachers worked. Three were government primary schools belonging to sub-stratum 1 of the sampling frame, seven were government primary schools in sub-stratum 2, and six were government primary schools in sub-stratum 3. One independent primary school was not represented in the data received. The data on which the Year 2 analyses for this study are based were collected from a sample of teachers which differed slightly in school representation from that originally defining the target population. The extent of this difference was much less in each of the three remaining teacher samples.

Of the 130 schools included in the target sample of Year 5 teachers, no teachers returned questionnaires from 13 schools, 11 of which were government primary schools. Three of these 11 schools had been selected from sub-stratum 1, five from sub-stratum 2 and three from sub-stratum 3. One school selected in each of the Catholic and independent school samples was not represented in the achieved sample.

All government high, technical and higher-elementary schools selected at the first stage of sampling were represented in the data collected from Year 8 mathematics teachers. One Catholic college and two independent colleges were not represented. Therefore out of a total of 136 secondary schools selected for the survey, teachers from 133 schools contributed data concerning the teaching of Year 8 mathematics. The response rate for schools in the sample of science teachers was only slightly different. Of a total of 136 schools, only four were not represented in the data collected. These four schools comprised one government high school, one Catholic college, and two independent colleges.

Survey Administration: Summary

The Teacher Survey Questionnaire was administered to teachers in Victorian schools over a period of about one month during the third school term in 1980. Response rates to the survey have been reported at two levels. First, at the teacher level, response rates ranged from 78.6 per cent for the Year 5 group to 85.1 per cent for the Year 8 science group. There were slight differences in the response rates of teachers working in the three educational sectors. At the school level, school response rates ranged between 83.1 per cent for the Year 2 sample to 97.8 per cent for the Year 8 mathematics sample.

Weighting Data prior to Analysis

Prior to analysis the data were weighted so that each school from which information was collected was represented by the same number of teachers. The reason for this has already been discussed. By employing a second stage of sampling, which selected all teachers who satisfied the defining characteristics of the target population from schools chosen at the first stage of sampling, teachers working in large schools were over-represented in the final samples. To overcome this problem, the data for each sample were weighted in the following way.

1 The total number of schools from which data had been collected was calculated. To this number was added another 'school'. This was because a small number of teacher questionnaires were returned which did not have the name of the school indicated. That is, the school variable could not be identified from the returned questionnaire. So that these questionnaires could be utilized, they were grouped together in a hypothetical school for the purpose of weighting the data (N_T) .

2 The total number of responses was calculated (R_T) .

3 The average number of responses per school was calculated $\frac{R_T}{N_T}$.

4 The actual number of responses for each school was calculated (r_s) .

5 All responses from each school were added and were weighted by a factor of $\frac{R_T}{N_T} \cdot \frac{1}{r_s}$.

This weighting procedure resulted in each school from which data were collected being represented by R_T/N_T teachers. For the Year 2 sample this number was 2.14 teachers, for the Year 5 sample 2.00 teachers, for the Year 8 mathematics sample 3.22 teachers, and for the Year 8 science sample this number was 2.57 teachers.

This describes the first weighting of data prior to analysis. However, not all schools which received questionnaires were represented in the data set compiled from the survey; the extent of this non-representation for each target sample has already been discussed. A second weighting of data was therefore necessary. Since there was no available information concerning the relative numbers of teachers in the three educational sectors for each of the populations under study, a weighting was not carried out to adjust for differential response rates between sectors. However, within the government schools selected in the primary year level samples, there was a differential 'school' response rate between the three sampling strata. The data derived from the Year 2 and 5 samples of government school teachers were therefore weighted to adjust for these differential response rates between strata. The method used for each sample was as follows:

Table 4.5 Weighting Factors Employed for Teacher Data Derived from Government Primary Schools for Year 2 and Year 5 Samples

Category of school	Weighting factor
Year 2 Stratum 1[a]	0.90
Stratum 2	1.01
Stratum 3	1.52
Year 5 Stratum 1	0.96
Stratum 2	1.01
Stratum 3	1.13

[a] Stratum 1: Special class schools larger schools
Stratum 2: Class 1, schools
Stratum 3: Class 2, Class 3 schools smaller schools

1 The total number of government primary schools was calculated (N_T) .

2 The number of schools selected in each stratum was calculated (N_S) .

3 The total number of schools from which data were received was calculated (n_T) .

4 The number of schools in each stratum from which data were received was calculated (n_s) .

5 All responses from schools in a particular stratum were weighted by a factor of $\frac{N_S}{N_T} \cdot \frac{n_T}{n_s}$.

Table 4.5 reports the weighting factors employed for data derived from government primary schools in each stratum. It was not necessary to weight data derived from teachers in Catholic and independent primary schools or data derived from teachers in secondary schools.

This concludes a consideration of the sample design and survey administration for the first stage of the Classroom Environment Study. The next three chapters are concerned with the analysis of data collected from teachers during the survey.

CHAPTER 5

TEACHER CHARACTERISTICS: RESULTS

Three sets of teacher characteristics were identified in Chapter 2 as being important ones for consideration in the Classroom Environment Study. These were: teaching experience, teachers' attitudes to curriculum aims, and teachers' preferred methods of teaching. The agreement between the teachers' broad educational aims and those of the schools in which they worked was also considered another contextual influence upon teaching practices worthy of investigation. The relevance of these teacher characteristics to the Classroom Environment Study has already been noted. Of particular importance are the attitudes of teachers to specific teaching practices which underlie the proposed instructional model for the study. Knowledge of these attitudes would be valuable in designing training programs for teachers prior to the experimental stage as well as assessing the possible widespread implementation of these teaching practices. Similarly, knowledge of teachers' attitudes to curriculum aims is of benefit since the teaching practices which will be investigated in the Classroom Environment Study have been selected because research has demonstrated their effect upon the learning of mathematics and the basic skills.

This chapter presents the findings of the survey in regard to each of the teacher background characteristics. Descriptive results are presented separately for each of the four teacher samples. In addition, attention is drawn to any differences between characteristics of teachers from different year levels and from different educational sectors.

Several simple guidelines were adopted to assist in the inspection of data, and particularly in the estimation of differences between groups of teachers. It will be noted that both mean and median scores (and more often the latter) are used to describe the variables measured in the survey. To assist in identifying group differences, the difference between mean group scores was listed and confidence limits for the difference between means at the 95 per cent level were estimated. A similar procedure was adopted for examining the difference between medians, this time based upon the standard error of proportions (Ferguson, 1966).

Another measure reported in the following chapters is percentage response for particular groups of teachers. The procedure for testing between percentage group responses described by Oppenheim (1973) was used to examine whether differences between groups were significant.

A further comment is required. The samples employed were not simple random samples of teachers. However, random samples of schools were selected with a probability proportional to size, and the average numbers of teachers per school ranged

Table 5.1 Teaching Experience of Teachers in the Classroom Environment Study Survey

Teacher sample	Teaching experience		
	Total teaching experience (years)	Subject-area experience (years)	Experience at present school (years)
Year 2	median: 6.6 mean: 9.4	median: 4.3 mean: 6.7	median: 3.2 mean: 3.9
Year 5	median: 7.5 mean: 9.7	median: 4.0 mean: 5.7	median: 3.1 mean: 3.7
Year 8 Mathematics	median: 6.4 mean: 8.9	median: 5.2 mean: 6.9	median: 3.8 mean: 5.0
Year 8 Science	median: 5.3 mean: 7.2	median: 4.6 mean: 5.9	median: 3.2 mean: 4.2

from 2.00 for the Year 5 sample of mathematics teachers to 3.22 of the Year 8 sample of mathematics teachers. Under these circumstances it is commonly considered necessary to apply a correction factor for the design effect of the samples to make allowance for the clustering of teachers within schools. However, because the testing for significance in the data served only as a coarse sieve, no allowances were made for the effects of the clustering of teachers within schools or for the fact that the data collected were being examined with multiple comparisons of the same data. The effects of failure to consider these two refinements were to increase the likelihood of certain chance differences being reported as being of significance. Nevertheless, because of the exploratory nature of the survey and because little weight has been given to statistical significance in the report, it is argued that the findings reported have not been unduly distorted.

Teaching Experience

Teachers in the four samples were asked to answer three questions about their teaching experience. These were: (1) How long in total have you been teaching? (2) How long have you taught lower primary school mathematics? (3) How long have you been in your present school? Wording of the second question was modified appropriately for the particular year level and subject area being investigated. Table 5.1 summarizes this information for each of the four teacher samples and both median and mean number of years experience are presented. The reason for including both measures of teaching experience is evident from Table 5.1. Because of the distribution of teaching experience throughout the teacher populations, there are marked differences between the two measures of central tendency. These differences reflect a teaching population which, in the main, is relatively inexperienced, but in which the overall range of teaching experience is large. For example, in the Year 2 sample the range of total years taught by teachers was from one year to 42 years; for the Year 5 sample the range was from one year to 37 years.

In general, the total teaching experience for teachers of Years 2 and 5 was slightly above that for the Year 8 mathematics teachers but substantially more than the total teaching experience of Year 8 science teachers. These data can be compared with several other Australian studies which have measured teaching experience at these year levels. Rosier (1980) has reported a mean number of years of teaching experience of 8.5 years for mathematics teachers of 13- or 14-year-old students in Victorian schools during 1978. The majority of these students would have been studying at the Year 8 level. An analysis of the characteristics of science teachers in Victorian secondary schools in 1976 was undertaken by Owen (1980). The data collected referred to teachers at the junior secondary school level, and therefore does not strictly correspond in year level to the data reported in this study. Owen (1980) found that the mean number of years of teaching experience of science teachers at this level was 6.8 years, slightly less than that found for Year 8 science teachers in the present study. In both studies approximately 50 per cent of teachers had less than six years teaching experience. Owen (1980) also collected data about the length of time teachers had taught in their present school, and reported a mean number of years of 3.3 years.

Broad Educational Aims of Teachers

Teachers were asked to indicate what they believed should be the overall purpose of education. They were presented with two commonly held beliefs about the general aims of education and weighted each in accordance with the emphasis they believed their school should place upon them. The weighting procedure used has been described in the previous chapter. Briefly, it required teachers to share five points between the two aims:

1 The purpose of primary/secondary education is to help equip students with skills and attitudes which will enable them to take their places effectively and competently in society, fitting them to make choices of occupational roles and to live harmoniously in the community.

2 The purpose of primary/secondary education is to foster the development of the children's individuality and independence, enabling them to discover their own talents and interests, find a full enjoyment of life in their own way, and arrive at their own attitudes towards society.

The extent to which teachers believed that education should be focused upon the first of these two aims, i.e. fitting students into society, is indicated in Table 5.2. Findings are presented for each of the four teacher samples in terms of the proportion of teachers

Table 5.2 Teacher Belief About the Societal Aim of Education as Indicated by the Allocation of Weightings to the Aim by Each of the Four Teacher Samples

Teacher sample	Proportion of teachers indicating this weighting (%)						Median score
	0	1	2	3	4	5	
Year 2	2.6	11.6	25.6	47.8	9.6	3.2	2.72
Year 5	1.4	8.1	26.6	50.4	11.6	1.9	2.78
Year 8 Mathematics	0.7	7.2	30.4	45.1	15.3	1.3	2.76
Year 8 Science	0.5	6.6	39.1	41.4	10.8	1.6	2.59

who allocated a particular weighting from 0-5; in addition median scores are recorded. Median scores concerning the extent to which teachers believed that schools should emphasize the aim 'fostering of individuality' can be obtained by subtracting the median scores in Table 5.2 from the maximum possible score of five points.

In general, teachers from the four samples believed that the overall purpose of education should place greater emphasis upon the student's role in society compared with fostering individuality amongst students. Approximately 60 per cent of teachers in each of the four groups placed greater emphasis upon the societal aim of education. However, this still leaves a substantial number of teachers in each group who believed that the primary purpose of education was the development of student individuality.

Teachers' beliefs about the extent to which the societal aim of education should be emphasized in schools were similar for Year 2 teachers regardless of whether they worked in government or Catholic schools. However, there were distinct differences between teachers from government and Catholic schools at the Year 5 level. Teachers in government schools generally indicated that the major purpose of education should be towards the societal role of the student (median score 2.86). Teachers in Catholic schools were less inclined to rate this as the primary aim of education (median score 2.38), but rather tended also to emphasize the fostering of individuality as a major educational concern at this school level (median score 2.62).

At the secondary school level, mathematics teachers in Catholic schools also expressed a belief that the primary purpose of education was towards fostering individuality amongst students. The median score for this aim amongst Year 8 mathematics teachers in Catholic schools was 2.75; for the societal aim it was therefore 2.25. By contrast Year 8 teachers of mathematics in government high and technical schools and in independent schools generally were of the opinion that the major emphasis in education should be placed on equipping students to fill their places in society. Median scores concerning emphasis upon the societal aim of education for these three groups of teachers were 2.82, 2.86 and 2.81 respectively. There were no major differences in beliefs about the fundamental purposes of education between science teachers from each of the four types of school. However, slightly more teachers from Catholic schools emphasized that the primary concern of education was towards the development of the student's individuality rather than equipping the students with skills and attitudes desired by society.

The procedure used in this item to obtain teachers' attitudes to each of the two educational aims was not entirely satisfactory. This is evidenced by a substantial amount of missing data for the items, ranging from 7.6 per cent for the Year 8 mathematics sample to 11.2 per cent for the Year 8 science sample. Many teachers whose responses were classified as 'missing data' in fact attempted the item. However, they allocated the same number of points to each aim or else shared the points between their 'ideal' and the emphasis the school actually placed upon the aim, a second part of the item which is discussed in the next chapter.

Attitudes to Curriculum Aims

The extent to which different curriculum aims influenced teachers in their teaching of the curriculum was examined in the survey. Teachers in the three samples concerned with the teaching of mathematics selected, from a common list of seven mathematics curriculum aims, the two aims which most influenced their teaching and the two aims which least influenced their teaching of mathematics at the year level being investigated. Teachers in the Year 8 science sample were given a list of typical science curriculum aims.

Table 5.3 summarizes the information collected from the three teacher samples concerned with the teaching of mathematics. Table 5.4 summarizes the information collected from teachers of Year 8 science.

The major feature of the results presented in Table 5.3 is that the rank order of the four most influential curriculum aims upon the teaching of mathematics was the same for the three year levels represented in the survey. In order of influence these were:

1. basic skills in computation and use of common measures;
2. an ability to apply mathematical ideas and skills to real-life situations;
3. awareness that mathematics is useful in everyday life; and
4. understanding relationships of space, quantity and number.

There was also general consensus that the least influential aim was knowledge of the nature of mathematical investigation and reasoning. It is interesting to examine the proportion of teachers who indicated that the curriculum aim 'basic skills in computation and use of common measures' was among the two aims listed which most influenced their teaching of the mathematics curriculum. Approximately 75 per cent of both Year 5 and Year 8 mathematics teachers commented that this was the case. Sixty-two per cent of Year 2 teachers said likewise. There appears therefore to be a group of teachers,

Table 5.3 The Relative Influence of a Set of Seven Mathematics Curriculum Aims upon the Teaching of Mathematics in Years 2, 5 and 8

Curriculum aim	Relative influence[a] of curriculum aim (median score) Year 2 sample	Year 5 sample	Year 8 sample
Basic skills in computation and use of common measures	1.30	1.18	1.15
Knowledge of mathematical terms	2.28	2.67	2.67
Understanding relationships of space, quantity and number	1.92	2.01	1.92
Knowledge of the nature of mathematical investigation and reasoning	2.72	2.60	2.57
Awareness that mathematics is useful in everyday life	1.92	1.91	1.91
Ability to apply mathematical ideas and skills to real-life situations	1.60	1.36	1.71
Ability to show flexibility, fluency and originality in thinking in mathematics-related situations	2.34	2.22	2.35

[a] Scale: (1) most influence - (3) least influence.

(approximately 25 per cent at the primary and lower secondary school levels, and particularly in the Year 2 sample, approximately 40 per cent, whose teaching is most influenced by curriculum aims other than one oriented towards basic skills in computation and measurement. There were only slight differences between the attitudes to the seven mathematics curriculum aims of government school teachers and Catholic school teachers at the Year 2 level. However, there was one difference at the Year 5 level which seemed noteworthy. Generally teachers in government schoools rated the aim of the basic skills in computation and measurement as being more influential in their teaching than did Catholic school teachers. Eighty-one per cent of Year 5 government school teachers responded that it was of 'most influence' compared with 55 per cent of Year 5 Catholic school teachers.

There was less agreement amongst science teachers in regard to the curriculum aims which most influenced their teaching of the science curriculum (see Table 5.4). The curriculum aim which was considered most influential, viz. 'basic knowledge about a wide range of scientific concepts', was actually included in only 47.4 per cent of teachers' ratings of the two aims which most influenced their teaching of Year 8 science. The curriculum aims, listed in decreasing order of influence, were:

1 basic knowledge about a wide range of scientific concepts;
2 skills in practical investigation, including use of laboratory equipment;
3 ability to apply scientific ideas and skills to real-life situations; and
4 understanding relationships concerning man and both the physical and biological environment.

Table 5.4 The Relative Influence of a Set of Seven Science Curriculum Aims upon the Teaching of Science to Year 8 Students

Curriculum aim	Proportion of teachers including this aim as 'most influence' (%)	Median score[a]
Basic knowledge about a wide range of scientific concepts	47.4	1.60
Understanding relationships concerning man and both the physical and biological environment	29.3	1.91
Knowledge of the nature of scientific investigation and reasoning	21.3	2.05
Skills in practical investigation, including use of laboratory equipment	40.9	1.70
Development of an understanding of the social implications of science	8.7	2.63
Ability to apply scientific ideas and skills to real-life situations	38.9	1.72
Ability to show flexibility, fluency and originality in thinking about science-related issues	14.8	2.27

[a] Scale: (1) most influence - (3) least influence.

Only a small group of science teachers indicated that the remaining three curriculum aims greatly influenced their teaching of Year 8 science.

Teachers working in each of the four types of schools generally agreed upon the relative influence of these curriculum aims upon their teaching.

Attitudes to Teaching Practices

The fourth set of teacher characteristics about which information was sought in the present study was the attitudes of teachers in each sample to the use of teaching practices. These teaching practices were derived from the instructional model and from the associated model of direct instruction. In addition, several items were included to gauge the teachers' attitudes to the dimensions of teaching style proposed by Eggleston et al. (1976).

Table 5.5 presents the findings of the survey concerning the attitudes of teachers to the 12 teaching practices listed for each sample. In addition, in Appendix II, Tables A.1 to A.4 record details of the proportion of teachers responding to each category contained in the four-point scale for the 12 items.

Three listed teaching practices can be related to the proposed instructional model for the Classroom Environment Study. Teachers' attitudes to these will be examined first. Giving students a clear indication of exactly what material they are to learn is a major element in the instructional cues category of variables in the model. However, generally teachers in all four samples did not place a great deal of emphasis upon this

Table 5.5 Attitudes Held by Teachers in the Four Teacher Samples to the Use of Teaching Practices

	Extent of use of preferred teaching practice			
Teaching practice	Year 2 maths sample (median)	Year 5 maths sample (median)	Year 8 maths sample (median)	Year 8 science sample (median)
Clearly defining what is to be learnt	2.98	2.32	1.99	2.34
Diagnostic testing at the end of each topic	2.00	1.84	1.43	1.92
Using a wide range of concrete materials	1.08	1.26	1.79	1.33
Using written instructional materials	2.35	2.20	1.80	2.14
Instructing students individually	1.91	1.93	1.91	2.29
Setting practice exercises	2.10	2.05	1.85	2.36
Setting 'higher-order' exercises	2.00	1.90	2.34	1.98
Student selection of activities	3.09	3.18	3.30	3.00
Whole class instruction	2.69	2.60	2.40	2.43
Testing and grading students	2.37	2.38	2.22	2.56
Setting of 'off-task' activities	2.63	2.54	2.83	2.67
Group work	2.55	2.59	2.97	2.43

Scale: (1) a great deal - (4) very little or none.

teaching practice. Teachers of Year 8 mathematics, compared with the remaining three samples of teachers, rated this teaching practice most highly; teachers of Year 2 mathematics rated the practice of least importance compared with their colleagues at other year levels. An examination of Table A.1 indicates that only 35 per cent of Year 2 teachers felt that they would use this teaching practice at least a moderate amount.

A second practice considered in the model is the use of tests for evaluation during the lesson or unit being studied. The item 'diagnostic testing at the end of each topic' corresponds, in part, to this teaching practice. This teaching practice was well supported by the majority of teachers in all four teacher samples. In the Year 8 mathematics teacher sample, diagnostic testing received the highest rating in terms of preferred use compared with the other 11 teaching practices. For the remaining three teacher samples, it was rated among the three most preferred teaching practices.

The third teaching practice concerns the managerial practice of establishing student expectations of testing and grading. Teachers were asked to indicate their preferred use of testing and grading students in accordance with their test performance. In general, teachers from the four samples indicated that they would prefer to use testing and grading in their classes moderately. However, there were considerable numbers of teachers who preferred to use this teaching practice only to a small extent, and some very little or not at all. For example, 21 per cent of Year 2 teachers responded 'very little or none'.

A further five teaching practices listed have been related to the amount of time students are actively engaged in learning. Instructing the whole class at once is one of these. Slightly less than half the teachers in the Year 2 and Year 5 samples preferred to use whole-class instruction for at least a moderate amount of time, while considerable numbers of teachers in these two groups preferred to use it very little or not at all. Year 8 teachers of mathematics and science preferred to use whole-class instruction only to a slightly greater extent than teachers at the primary school level.

Asking students to complete exercises and assignments about work already covered in class is another teaching practice which has been associated with increased student time-on-task and the direct instruction model of teaching. In general, teachers in all four samples expressed the view that a moderate amount of such exercises should be given to students.

Teachers indicated their attitudes to three teaching practices that have been associated with reduced student time-on-task and student achievement. Two of these practices related to student-centred instruction. There was general agreement amongst teachers in the four samples, and particularly those concerned with mathematics teaching, that giving students their own learning assignments and then instructing students individually is a preferred method of teaching. However, such a teaching practice may lead to decreased teacher interaction with students and hence decreased student time-on-task (Rosenshine, 1979). Similarly, allowing students to select their own learning activities reduces the amount of control the teacher has over student learning and decreases the amount of time the teacher interacts with the student. In this case, however, only a small proportion of teachers in each of the four samples indicated that they would employ such a teaching practice to any considerable extent. The third teaching practice which could be expected to be negatively related to student learning of the prescribed curriculum was allowing students to do activities other than those specific to the curriculum objectives. While there was general agreement that this was not a preferred teaching practice to any large extent (all median scores were greater than 2.50), a substantial number of teachers in the four teacher samples responded that they would allow a moderate amount of such classroom activity.

An alternative method of class organization is giving students work to be completed by groups. It has been argued by Johnson and Johnson (1979) that this teaching practice is positively associated with student academic development, including concept development. Year 8 mathematics teachers responded that they would not use this method of class organization to any large extent (median score: 2.97). In only the Year 8 science sample did a majority of teachers state that they would use at least a moderate amount of group work during their lessons. We can assume that in this case the major emphasis would be placed upon practical work in the laboratory.

The remaining three teaching practices about which teachers' attitudes were sought related to the model of teaching styles proposed by Eggleston et al. (1976). The first of these was giving students the opportunity to learn through experience with a wide range of concrete materials. The majority of teachers in both primary school samples and the Year 8 science sample stated that they would prefer to use concrete materials 'a great deal' of the time in their lessons. Median scores for the three groups were: 1.08 (Year 2 mathematics teachers), 1.26 (Year 5 mathematics teachers) and 1.33 (Year 8 science teachers). In the case of the teaching of Year 8 mathematics, by far the majority of teachers indicated their preference to use concrete materials at least a moderate amount in their lessons. By contrast the use of written materials was considered generally less favourably by teachers, except those involved in the teaching of Year 8 mathematics. In this latter instance, equal emphasis was placed upon the use of concrete materials and the use of written materials such as text books and worksheets.

The final results are concerned with the setting of activities which require students to complete more 'open' types of learning tasks. There was general acceptance of this as an important teaching practice amongst teachers from all groups, except those teaching Year 8 mathematics. Approximately 45 per cent of this latter group responded that they would set these types of learning activities, at the most, only to a small extent.

In summary, there was widespread acceptance of most of the teaching practices listed, particularly use of diagnostic testing, use of concrete materials, and giving students their own learning assignments. Student group work, student selection of their own learning activities, and allowing students to undertake learning activities other than those specific to the curriculum objectives were the least preferred teaching practices among the teachers in each of the four samples. In addition, the lack of support among a substantial group of teachers for instructing the whole class at once and for giving students a clear indication of the material to be learnt should be noted.

It is interesting to ask: Of the four groups of teachers, which groups expressed the most similar set of attitudes to the teaching practices listed and which expressed the least similar set of attitudes? An examination of the profiles of responses characterizing each teacher group provides an indication of the extent of these similarities.

There are two measures of profile similarity which are appropriate - the product-moment correlation (r) and the distance measure (D). The product-moment correlation focuses upon the shape of each profile, measuring the extent to which two profiles possess the same overall shape. The distance measure examines three characteristics of the profiles as a means of estimating profile similarity: shape, dispersion, and level of effect. The larger the D-score the less similar are the profiles.

This latter technique has been described in detail by Nunnally (1967).

Four comparisons of the profiles of teachers' attitudes to these teaching practices were made. The resulting product-moment correlations were:

$r_{\text{maths2 - maths5}} = 0.92$
$r_{\text{maths5 - maths8}} = 0.80$
$r_{\text{maths2 - maths8}} = 0.61$
$r_{\text{maths8 - science8}} = 0.70$

From these correlations we can say that there was an extremely high degree of similarity between the attitudes of the Year 2 and Year 5 teachers in regard to the usefulness of the 12 teaching practices which were listed. This is indicated by the correlation between the attitudes of both these groups of teachers ($r = 0.92$). The similarity between the attitudes of Year 5 and Year 8 mathematics teachers and between the attitudes of Year 8 mathematics and science teachers was slightly less ($r = 0.80$ and 0.70 respectively). Least similarity was observed between the profiles of teachers of Year 2 and Year 8 mathematics ($r = 0.61$).

The calculation of D measures led to similar findings:

$D_{\text{maths2 - maths5}} = 0.75$
$D_{\text{maths5 - maths8}} = 1.20$
$D_{\text{maths2 - maths8}} = 1.65$
$D_{\text{maths8 - science8}} = 1.33$

From an examination of the results obtained from both approaches to investigating profile similarity, a consistent pattern of group differences of attitudes to the overall range of teaching practices listed was derived. The attitudes to the suggested teaching practices held by Year 2 and Year 5 teachers were most similar. Year 2 and Year 8 teachers of mathematics were least similar in their attitudes to the relevance of these practices to the teaching of mathematics, and even less similar than Year 8 mathematics and Year 8 science teachers commenting upon the relevance of the practices to the teaching of mathematics and science curricula.

Several differences between attitudes held by teachers working in different types of schools emerged. At the Year 2 level, substantially more teachers working in Catholic schools favoured giving students their own learning assignments than did teachers from government schools: median scores of 1.43 and 2.05 characterized each group respectively. Again more Catholic school teachers favoured allowing students to select their own learning activities than did government school teachers at this year level. However the difference in regard to this attitude was not as large as that found in the previous instance, with median scores of 2.77 and 3.17 for each group respectively.

There were also two substantial differences between the attitudes held by government school teachers and Catholic school teachers at the Year 5 level. Catholic school teachers favoured both using written materials and allowing students to undertake activities not specific to the curriculum objectives (median scores of 1.92 and 2.20 respectively) more than teachers working in government schools (median scores of 2.31 and 2.64 respectively).

There appeared to be very few differences between the attitudes towards the 12 teaching practices held by secondary teachers working in each of the four types of schools comprising the secondary school sample. Among the Year 8 teachers of mathematics, one difference emerged and deserves mention, as it is included in the proposed instructional model for the Classroom Environment Study. Teachers differed in their attitudes towards testing and grading students in accordance with their test performance. More teachers working in Catholic and government technical schools (median scores of 2.02 and 2.07 respectively) favoured this teaching practice than did teacher from government high and independent schools (median scores of 2.33 and 2.45 respectively). This difference was not found among Year 8 science teachers working in these schools.

Teacher Characteristics: Summary

Three aspects of teaching experience were examined in the survey. These were total length of teaching experience, the amount of time teaching the relevant subject area and year level, and the length of experience in the present school. These three teacher characteristics are of relevance in the selection of teachers (and classes) for the correlational stage of the Classroom Environment Study. It seems undesirable to select classes of students who are being taught by very inexperienced teachers, such as those who are in their first year out from teacher training institutions, teaching the curriculum for the first time, or teaching in a school for the first time. This is particularly so if the correlational study is due to commence at the start of a school year.

The majority of teachers indicated that the school should place more emphasis upon equipping students with skills and attitudes which would enable them to take their place effectively in society than with fostering the development of individuality and independence among its students. However, it should be pointed out that this finding refers to a balance of emphasis between the two educational aims, and does not indicate that the majority of teachers would wish schools to emphasize only the societal aim to the exclusion of fostering student individuality. This would appear to be an important finding for the Classroom Environment Study. Widespread acceptance of the proposed instructional model, with its emphasis upon the maintenance of time-on-task, teacher specification of learning objectives and frequent testing would be more difficult to achieve in a setting where teachers believed that the primary purpose of education was for students to discover their own talents and interests and develop independence. While teachers indicated that they preferred the setting of individualized assignments for their students, these assignments were prescribed by the teacher. In fact the majority of teachers indicated that they preferred not to allow students to select their own learning assignments or undertake activities other than those specific to the curriculum objectives. Neither of these two latter practices might be expected to lead to high task orientation compared with that achieved by more teacher-directed instruction.

The finding that the curriculum aim most influencing the teaching of mathematics in each of the three samples was 'basic skills in computation and use of common measures' is also of some consequence. Much of the research upon which the identification of the 20 specific teaching behaviours has been based for investigation in the Classroom Environment Study was concerned with the teaching of basic skills in mathematics and reading. From the findings of the present study, it would appear that the aims of the curriculum emphasized by the three samples of mathematics teachers are of the type which might be achieved using the teaching practices suggested. The situation is far less clear in the case of Year 8 science teaching, with slightly less than one half the science teachers reporting that most emphasis in their teaching was placed upon 'basic knowledge about a wide range of scientific concepts'. Thus it can be suggested that in the Australian setting, the teaching behaviours being investigated in the Classroom Environment Study are more appropriately related to the learning of mathematics at all year levels than they are to the learning of science at the Year 8 level.

An examination of the emphasis placed upon curriculum aims by each of the four samples of teachers was important for a second reason. It is essential that the development of student outcome measures for use in the correlational study should be congruent with the intended aims of teaching. From the present study it appears that the majority of mathematics teachers, particularly those teaching Year 5 and Year 8 students, emphasize the teaching of basic mathematical skills, and to a lesser extent the remaining mathematics curriculum aims which were listed. Outcome measures developed for the correlational study would need to reflect this relative emphasis of curriculum aims. On the other hand the widespread differences in emphasis upon science curriculum aims characterizing the teaching of Year 8 science would make it difficult to develop uniform student outcome measures that could be applied to different classes in the correlational study. Even in the case of the measurement of mathematics outcomes, the differences in emphasis upon curriculum aims between teachers was sufficient to suggest that it may be preferable to use both a common set of achievement items for all classes and a class-specific set of achievement items as a more accurate reflection of the curriculum taught to individual classes.

CHAPTER 6

MEDIATING INFLUENCES: RESULTS

Teaching practices are influenced not only by teacher characteristics but also the context in which teaching and learning take place. The Teacher Survey Questionnaire examined four sets of contextual factors which were thought important in their effects upon teaching practices, effects which could be either direct or indirect through their mediation of the influence of teacher characteristics. These contextual factors fell into four categories: instructional setting, resource allocation for lesson preparation and correction, teacher autonomy, and aims of the school. This chapter describes each of these aspects of the teaching-learning context for teachers (and classes) at the three year levels and across the two subject areas investigated in the present study.

There were several important reasons for collecting this information. The first was to establish the diversity of instructional settings, enabling more informed decisions to be made concerning the extent to which we might wish to examine the generalizability of teaching practice effects. For example, if it was found that there were several teaching arrangements occurring frequently across classes, then we might wish to determine whether the proposed teaching practices were appropriate in each type of teaching arrangement. Similarly, if there was a substantial proportion of composite classes, then the question of the effectiveness of the teaching practices in this form of class organization compared with a non-composite organization might be an important consideration. In both instances there are implications for the design of the correlational study, especially the type of classes selected in the correlational sample. A second reason also concerns the design of the correlation study, particularly the observation of teaching practices and the prescription of the curriculum to be investigated. Characteristics such as teaching arrangement, year-level composition, and class size will influence the development of the methodology used in the observation of both students and teachers. Knowledge of the typical, everyday curriculum which is taught in the classroom will facilitate the selection of the most appropriate form of curriculum for the correlational study. The third reason relates to the implementation of the proposed instructional model both during the experimental stage of the study and subsequently more widely across schools. Information relating to teacher autonomy, resource allocation and school aims provides an indication of the relevance of the model to current school policies and practice.

Instructional Setting

Information was sought about five major elements of the instructional setting: class size

Table 6.1 Year Level Composition of Classes being Taught Mathematics by Year 2 and Year 5 Teachers

Year level composition of classes	Proportion of classes (%)
Year 2 teacher sample	
Year 2 students only	72.1
Year 1 and 2 students combined	13.8
Year 2 and 3 students combined	11.4
Year 1, 2 and 3 students combined	2.7
Year 5 teacher sample	
Year 5 students only	59.4
Year 4 and 5 students combined	10.5
Year 5 and 6 students combined	21.2
Year 4, 5 and 6 students combined	8.9

and year level composition, teaching arrangement, student ability, allocated time and topics being taught.

1 Class size and year level composition

There is a major difference in the composition of classes at the primary school level and the secondary school level in Victorian schools. At the primary school level, classes may often comprise students of different year levels. This is quite rare at the secondary school level. Therefore, before considering the class-size of primary school classes in the study, the year level composition of those classes must be examined. This then allows a consideration of the total number of students in the class and the number of students at the year level being investigated.

The year level composition of classes being taught mathematics by Year 2 and Year 5 teachers is presented in Table 6.1. Approximately 28 per cent of classes taught mathematics by Year 2 teachers were composite classes. The proportion was higher among Year 5 teachers, where approximately 40 per cent of classes taught included students other than Year 5 students. It should be emphasized that some of these might have been composite classes for the teaching of mathematics only; they may not have been similarly structured for the teaching of other subject areas.

It should also be pointed out that a composite class can be structured in several ways. For example, Year 5 level mathematics may be taught only to Year 5 students and the remaining students work on mathematics curricula appropriate to their year level. Alternatively, Year 5 mathematics may be taught not only to Year 5 students but also to students from other years. The questionnaire did not examine the operation of composite classes in this detail.

Composite classes were more prevalent in government primary schools than in Catholic primary schools. The proportion of Year 2 teachers working in government schools who reported that they were teaching mathematics to Year 2 students in

Table 6.2 Size of Classes Taught According to Year Level and Subject Area

Type of class[a]		Class size (mean score)[b]
Year 2	Non-composite	30.1
	Composite (all students)	28.2
	Composite (Year 2 students)	14.0
Year 5	Non-composite	30.4
	Composite (all students)	29.8
	Composite (Year 5 students)	15.2
Year 8	Mathematics	24.6
Year 8	Science	25.5

[a] For Year 2 and Year 5 composite classes both the total number of students in the class and the number of target (either Year 2 or Year 5) students are shown.

[b] Mean scores are presented for comparative purposes as class size is generally reported using this statistic rather than median scores.

composite classes was 31.3 per cent, compared with 13.8 per cent of Year 2 Catholic school teachers. The incidence of composite classes for the teaching of mathematics at the Year 5 level was 46.4 per cent in government schools. By contrast 19.2 per cent of Year 5 teachers in Catholic schools indicated that for the teaching of mathematics Year 5 students were in composite classes. There were insufficient teachers (and hence classes) working in independent primary schools in the survey sample to examine the occurrence of composite classes in the independent school sector.

The mean class size of classes taught by teachers in the sample is presented in Table 6.2. At the Year 2 and Year 5 levels, classes were grouped according to whether they were composite classes or not. The mean total number of students in the composite class is given for each sample, followed by the number of students at the specific year level being investigated. From these results it appears that classes in primary schools are considerately larger than those at the junior secondary school level. On average, non-composite classes at the Year 2 and Year 5 level comprised approximately 30 students compared with 25 students in Year 8 mathematics and science classes.

Composite classes tended to be slightly smaller than non-composite classes in the Year 2 sample; however no such difference existed at the Year 5 level. In addition, the average number of students at the year level being surveyed in composite classes was typically about one-half the total number of students in the class. This was true for both the Year 2 and Year 5 samples.

There were considerable differences in the size of Year 8 classes in which teachers from different types of secondary schools were working. An examination of Table A.5 indicates that, on average, the class sizes of Year 8 mathematics and science classes in

Table 6.3 Proportion of Different Teaching Arrangements for Classes being Taught by Teachers in Each of the Four Samples

Teaching arrangement	Year 2 sample (%)	Year 5 sample (%)	Year 8 maths sample (%)	Year 8 science sample (%)
One teacher only	82.6	74.3	84.1	94.4
More than one teacher at the same time	3.9	8.7	2.6	1.1
More than one teacher but at different times	2.5	2.4	2.4	4.3
Specialist teaching at various times[a]	10.1	13.7	9.5	-
Combination of the above	0.9	0.9	1.2	-

[a] Not included in Teacher Survey Questionnaire for science teachers.

Catholic schools were substantially larger than classes in government high schools and independent schools. Class sizes in government high schools were, in turn, larger than Year 8 mathematics and science classes in the technical schools in the sample. In general, there were no differences in the sizes of classes of primary school teachers working in the different educational sectors.

2 Teaching arrangement

Teachers were asked whether they were the only teacher taking the class. Details of the teaching arrangements characterizing classes taught by teachers in the survey sample are contained in Table 6.3.

Approximately 74 per cent of Year 5 teachers indicated that they were the only teacher taking the Year 5 class for mathematics. This compares with 94 per cent of Year 8 science teachers who indicated that the Year 8 classes to whom they taught science were being taught science only by them. In the case of those classes taught by more than one teacher, the most prevalent teaching arrangement was for the class teacher to be assisted by a specialist. This specialist teacher took students from the class at various times for instruction. We can assume that this specialist instruction was generally for remedial purposes. However, it should be noted that the most frequent occurrence of this teaching arrangement was only 13.7 per cent of classes, and this occurred in the teaching of Year 5 mathematics.

3 Student ability level

A third element within the instructional setting which may influence teaching practices adopted by teachers is the ability level of the students. The question in the Teacher Survey Questionnaire asked teachers which of the following, in their opinion, best described the ability level of their class:

(a) about the same in maths (or science) ability as most students in their age group;
(b) lower in maths (or science) ability than most students in their age group; or
(c) higher in maths (or science) ability than most students in their age group.

Table 6.4 Ability Level of Classes being Taught by Teachers in Each of the Four Samples

	Proportion of classes			
Ability level	Year 2 sample (%)	Year 5 sample (%)	Year 8 maths sample (%)	Year 8 science sample (%)
Same as most students in their age group	76.0	69.9	54.2	66.0
Lower in ability than most students in their age group	11.5	17.8	33.4	25.0
Higher in ability than most students in their age group	12.5	12.3	12.4	9.0

The results obtained from this question are presented in Table 6.4. Across the four samples, it is evident that the majority of teachers considered that the students in their classes were about the same in ability level as most students in their age group. The classes referred to here are those of the year level and subject area under examination and do not include other classes which the teachers may have been teaching.

There is one interesting trend in the data reported in Table 6.4. Teacher perceptions are that with increasing year level there is a decrease in the proportion of mathematics classes which are characterized by a spread of student ability typical of the age group. At the Year 2 level, the proportion was 76.0 per cent and, at the Year 8 level, the proportion for mathematics was reduced to 54.2 per cent. There was a corresponding increase in the proportion of lower ability classes, ranging from 11.5 per cent at the Year 2 level to 33.4 per cent at the Year 8 level for mathematics. There was not a parallel increase in the proportion of 'higher ability' classes, the proportion remaining constant at about 12 per cent.

It would appear that, with increasing year level, streaming for the teaching of mathematics more frequently occurs. However, such streaming would appear to be restricted to differentiating students of low ability in mathematics from the remaining students and to fail further to differentiate students of high ability in mathematics from students of average ability. An alternative explanation might be that teachers become increasingly dissatisfied with the mathematical achievement of students at higher year levels. In this case they may tend to perceive their students as being of lower ability, since teachers possess few means of comparing the standards of their students with those of other classes.

Several comments can be made concerning teacher responses to this question. First, a small group of teachers stated on the questionnaire that they had difficulty in responding because of lack of experience. The phrase 'in your opinion' had been inserted in the item as an attempt to overcome this problem. Secondly, some teachers, and again

Table 6.5 Amount of Allocated Time and the Number of Teaching Sessions for Classes in Each of the Four Samples

Teacher sample	Amount of allocated time: Minimum (minutes)	Maximum (minutes)	Median[a] (minutes)	No. of teaching sessions (median)
Year 2 maths	120	420	240	5.0
Year 5 maths	120	540	270	4.9
Year 8 maths	86	600	225	4.4
Year 8 science	75	360	150	2.8

[a] Rounded to nearest appropriate time unit.

these constituted only a very small group, indicated that a further item should have been included which examined the range of ability within the class. During the trial of the questionnaire such an item was included. However, so few teachers indicated that the range of ability level of their class was extremely broad that it was later dropped from the questionnaire.

4 Allocated time

The amount of time allocated to the teaching of the curriculum is an important consideration in a study of teaching and learning. Its relationship with student performance has been discussed in earlier chapters of this report. In order to seek information about the amount of time allocated to the teaching of mathematics (or science) at the year levels investigated in this survey, the following question was asked: How much time each week is allocated to this class for studying mathematics (or science)? Teachers were asked to include total time not just time taught by them, as could occur in a team-teaching situation. In addition, teachers were asked to state, on average, how many teaching sessions each week were included in period of allocated time. Results from this section of the questionnaire are presented in Table 6.5.

The median values for the amount of time allocated to the teaching of mathematics across the three year levels did not vary greatly. On average, Year 8 students in mathematics classes were allocated 225 minutes of instruction per week, Year 2 students approximately 240 minutes of mathematics instruction per week, and finally Year 5 students were allocated approximately 270 minutes of mathematics instruction per week. However, the range across classes in terms of the amount of allocated time was extremely large at each level. Classes within the three year levels were allocated up to four, or even seven, times the amount of mathematics instruction per week than were other classes at the same year level. Similar trends were evident when the numbers of teaching sessions per week were examined. Year 2 and Year 5 classes were taught mathematics approximately five times per week or once each day, and Year 8 mathematics classes received mathematics instruction, on average, 4.4 times per week. However, the range in the number of teaching sessions per week parallels that of the amount of allocated time. Some classes received mathematics instruction twice a week and other classes received instruction up to eight times per week at the primary school level and seven times per week at the secondary school level. Finally, several primary school teachers indicated that there was no fixed allocated time for the teaching of mathematics and much of their mathematics instruction was dispersed throughout the teaching of other subject areas.

The amount of time allocated to the teaching of science was much less than that allocated to the teaching of mathematics at the Year 8 level. On average, science classes received 150 minutes per week of science instruction, although some classes received as little as 75 minutes and other classes received up to 360 minutes of instruction. Generally this instruction was presented in three teaching sessions per week with a range of one to six teaching sessions being reported.

There were no substantial differences across classes from each of the three educational sectors in regard to the amount of allocated time for either mathematics or science instruction at the year levels investigated.

5 Topics taught

The final aspect of the instructional setting which will be reported in this section concerns the topics taught by teachers responding to the questionnaire. Teachers were asked to list the mathematics (or science) topics they had been teaching their class during the last five school days prior to the completion of the questionnaire.

Mathematics topics were coded into categories which corresponded, with minor modification, to those categories used in the Victorian Education Department's mathematics curriculum guide for primary schools. For the coding of topics taught at the Year 2 and Year 5 levels, the following categories were used: (1) basic operation and number facts, (2) fractions, (3) measurement, (4) basic properties, (5) spatial relations, (6) pattern and order and place value, (7) statistics and graphs, and (8) money.

For the coding of responses at the Year 8 level, mathematics topics were grouped into categories as follows: (1) basic numeration, (2) fractions and decimals, (3) measurement, (4) algebraic equations, (5) geometry, trigonometry and spatial relations, (6) statistics, and (7) graphs.

The coding of science topics grouped the topics being taught by teachers into six major categories: (1) biology, (2) physics, (3) geology, (4) chemistry, (5) astronomy, and (6) environmental science. A description of the content areas taught during the five school days prior to the survey for each of the three year levels and two subject areas is to be found in Appendix I in Tables A.6 - A.8.

Two questions were of interest. First, it was important to obtain an indication of the total number of topics taught during the period. It could be expected that, with

Table 6.6 Total Number of Content Areas Taught during the Five School Days prior to Questionnaire Completion for Each Teacher Sample

Teacher sample	Total number of content areas taught					Individual assignments[a]	Median score[b]
	1 (%)	2 (%)	3 (%)	4 (%)	5 or more		
Year 2	6	29	37	23	5	-	2.9
Year 5	15	38	28	14	3	1	2.4
Year 8 maths	62	27	2	0.2	0.4	9	1.3
Year 8 science	89	10	-	-	-	1	1.4

[a] The percentage of teachers who indicated that each student was working on his or her own topic.

[b] The median score was calculated not including the number of cases grouped as individual assignments.

increasing variety of topics taught, there might be a parallel increase in the variety of the teaching practices adopted. Table 6.6 presents information about the total number of topics taught during the five school days prior to the completion of the questionnaire.

Secondly, it was important to know what topics, in terms of content area, were being taught during this period. This, in turn, would enable an investigation of the relationship between type of content area and types of teaching practices adopted for the teaching of that topic. However, the differentiation of mathematics topics into the suggested categories proved often an extremely difficult task. In many instances there was considerable overlap of categories into which a topic might be placed. This was largely because of the open-response type of item used to obtain information on the topics being taught. For this reason one must consider the findings of this aspect of the survey as presenting only a moderately accurate description of the content areas being taught in mathematics at the three year levels during the time of the survey. While a similar difficulty existed with the grouping of science topics into content areas, it was not as extensive.

There were marked differences in the total number of mathematics content areas taught during a school week by teachers at the primary school level as compared with those at the secondary school level. On average, teachers at the Year 2 level taught topics from 2.9 mathematics content areas and at the Year 5 level from 2.4 content areas. This compares, at the secondary school level, with Year 8 mathematics teachers who have taught topics selected, on average, from 1.3 content areas during the school week prior to the survey.

An examination of Table 6.6 indicates that science teachers generally restricted themselves to teaching topics from only one of the basic content areas of science. Topics were generally selected from either biology (39 per cent) or physics (34 per cent) content areas. The two next most frequently taught content areas were chemistry (11 per cent) and geology (9 per cent). Seldom did teachers indicate that they were teaching topics selected from either astronomy or environmental science, although topics from both of these content areas might also have been included in physics and biology respectively.

The three most frequently mentioned content areas from which topics were selected for the teaching of Year 2 mathematics were:

(a) patterns and order,
(b) basic operations and number facts, and
(c) basic properties.

At the Year 5 level, the three most frequently mentioned content areas were:

(a) basic operations and number facts,
(b) fractions, and
(c) measurement.

However, as has already been noted, it was difficult in many instances to code the teachers' responses into the categories used. For example, in the teaching of fractions, the content areas of basic properties and basic operations are also involved.

Different categories of content areas were used in the grouping of the topics listed by Year 8 mathematics teachers. The three most frequently mentioned content areas from which topics were selected by this group of teachers were:

(a) algebra,
(b) geometry, trigonometry and spatial relations, and
(c) fractions and decimals.

These three content areas were equally represented among the topics listed by teachers. As in the previous set of findings, there was considerable difficulty experienced in coding a small number of teachers' responses. Therefore the results reported here should be taken as a rough guide to the types of content covered by Year 8 mathematics teachers during their lessons just prior to completion of the questionnaire.

Resource Allocation for Lesson Preparation and Correction

Two aspects of resource allocation for lesson preparation and correction were examined in the survey. The first of these was the ancillary staff help that teachers received. The second was the amount of time during the school day when teachers were not teaching lessons to their classes.

1 Ancillary staff help

Teachers in the four target samples were asked to consider whether they usually made use of ancillary staff for the preparation of materials. In addition, they were asked to

Table 6.7 Amount of Ancillary Staff Help Used by and Available to Teachers in Each of the Four Samples

	Ancillary staff help		
Teacher sample	Yes (%)	No - assistance is not available (%)	No - but assistance is available (%)
Year 2	22	67	11
Year 5	22	59	19
Year 8 maths	14	68	17
Years 8 science	15	60	26

indicate whether such assistance was or was not available. Teachers teaching Year 8 science were also asked the same two questions but this time in regard to their use of laboratory assistants. Information concerning the use of ancillary staff by teachers is presented in Table 6.7 and the use of laboratory assistants by science teachers is presented in Table 6.8.

It is evident from Table 6.7 that for the majority of teachers ancillary staff are not available to help in the preparation of material for class lessons. This is true for teachers from each of the four samples. Nevertheless, this does not mean that, given the access to ancillary staff help, teachers would necessarily use it. About 25 per cent of science teachers indicated that ancillary staff assistance was available, but that they declined to use it. Substantial numbers of teachers in the two samples concerned with the teaching of mathematics to Year 5 and Year 8 students indicated likewise. However, at the Year 2 level, this number was only 11 per cent of the total sample of Year 2 teachers. As will be seen from Table 6.8, for the majority of science teachers there was laboratory assistant help available for the preparation of materials, and most teachers made use of it. Only 22 per cent of science teachers indicated that such help was not available.

2 Lesson preparation and correction time

The allocation of time during the school day for lesson preparation and correction was examined by asking teachers the following question:

> How much time per week in your timetable is not allocated to teaching and specific non-teaching duties such as sport, but is available for lesson preparation and correction? Do not include lunchtime, assembly time, or staff meeting times.

Table 6.8 Amount of Laboratory Assistant Help Used by and Available to Year 8 Science Teachers

	Laboratory assistant help		
Teacher sample	Yes (%)	No - assistance is not available (%)	No - but assistance is available (%)
Year 8 science	66	22	12

Table 6.9 Time per Week Available for Lesson Preparation and Correction during the School Day for Each of the Four Teacher Samples

Teacher sample	Amount of time available expressed in hours (median)
Year 2	1.6 hours
Year 5	1.7 hours
Year 8 maths	6.2 hours
Year 8 science	6.4 hours

Teachers at the primary school level were requested to indicate their response on a five-point scale 'none' to 'about four hours or more'. Secondary school teachers responded on a five-point scale 'less than five hours' to 'about eight hours'. The trial of the questionnaire had suggested the suitability of the ranges of these scales. Teachers' responses for each of the four samples are summarized in Table 6.9 and presented in detail in Appendix II in Tables A.9 and A.10.

There was a large difference between primary school teachers and secondary school teachers in the amount of time per week available for lesson preparation and correction during the school day. The majority of Year 2 and Year 5 teachers had less than two hours per week available to them for this purpose. By contrast the majority of Year 8 mathematics and science teachers had at least six hours per week allocated in their school timetable for lesson preparation and correction.

There were differences in the amount of time allocated for lesson preparation and correction according to the type of school in which primary school teachers worked. In general, government primary school teachers were allocated nearly two hours per week in their timetable for this purpose. By contrast, the majority of Catholic primary school teachers were allocated no such time. Both findings were true at the Year 2 and Year 5 level.

Among secondary school teachers, there were also differences in the amount of allocated time for lesson preparation and correction according to the type of school in which the teachers worked. For teachers of mathematics, the average preparation time for high school teachers was 6.5 hours, for technical school teachers 6.0 hours, and for Catholic school and independent school teachers about 5.5 hours. In regard to the teaching of science, government high school teachers were again allocated a greater amount of preparation and correction time than teachers working in each of the three remaining types of school. On average, high school teachers were allocated approximately seven hours per week in their timetable for lesson preparation and correction compared with about six hours for Catholic school and technical school teachers; science teachers in independent schools received only about five hours in their timetable for such purposes.

Teachers spend time apart from that allocated in the timetable in lesson

Table 6.10 Amount of Time Spent during Lessons and outside Normal School Hours in Lesson Preparation and Correction by Teachers from the Four Samples

	Number of hours in lesson preparation and correction per week	
Teacher sample	During lessons (median)	Outside normal school hours (median)
Year 2	1.9	5.8
Year 5	1.7	5.5
Years 8 maths[a]	n/a	4.6
Year 8 science	0.2	5.0

[a] Data about time spent during lessons on preparation and correction for Year 8 mathematics teachers was not collected.

preparation and correction. This time can be spent during other lessons or outside normal school hours. Teachers were asked how much time they spent during lessons and outside normal school hours in preparing lessons and correcting student work. These findings are reported in Table 6.10. It should be noted that these results refer to lesson preparation and correction for all subjects the teachers taught.

Teachers were asked to indicate the amount of time they had spent in lesson preparation outside normal school hours during the five school days (and weekend) prior to questionnaire completion. During the course of the present study a substantial number of schools received a one-day public holiday. Concern was felt that some teachers may have included this public holiday in their estimates of time related to lesson preparation, even though the phrase 'five school days' was used to define the time period. As a safeguard against an under-estimation of time spent in lesson preparation outside normal school hours or during lessons, estimates reported in this section are based upon those questionnaires received at least 12 days after the public holiday. There was no difference in these time estimates compared with those obtained from teachers completing their questionnaires at a time closer to the public holiday. Similarly no differences emerged between questionnaires received at later dates after the public holiday and either of the two previous estimates. This stability of estimates over time would indicate that the majority of teachers based their time estimates for lesson preparation on the five school days, not including the public holiday, prior to completion of the questionnaire.

Year 2 and Year 5 teachers spent on average 1.9 hours and 1.7 hours respectively during classroom lessons each week in lesson preparation for all subject areas. This type of information was not available for teachers of Year 8 mathematics. However, the amount of time spent in lesson preparation during classroom lessons by science teachers was obtained. These teachers spent very little time during lessons in either preparation or correction.

Table 6.11 Proportion of Teachers in Each Sample Spending Various Amounts of Time outside Normal School Hours in Lesson Preparation and Correction for all Subjects Taught

	Proportion of teachers (%)			
Amount of time	Year 2 maths sample	Year 5 maths sample	Year 8 maths sample	Year 8 science sample
0-2 hours	17.7	13.4	29.0	19.1
3-5 hours	29.2	35.5	31.1	36.4
6-8 hours	33.6	31.8	16.0	20.1
9-11 hours	11.3	11.6	16.2	14.3
12-14 hours	6.3	3.6	3.5	6.6
14 hours or more	1.9	4.1	4.2	3.5

Teachers spent a great deal more time outside normal school hours in lesson preparation and correction for all subjects than they did during lessons. Teachers in Year 2 and Year 5 reported that they spent, on average, about 6 hours per week either before school started, after school finished or at home preparing for lessons. Secondary school teachers reported a slightly less amount of time. Year 8 mathematics teachers reported an average of 4.6 hours per week spent outside normal school hours in lesson preparation and Year 8 science teachers an average of 5.0 hours per week.

It is of interest to examine the proportion of teachers spending different amounts of time per week outside normal school hours on lesson preparation and correction. This information is presented in Table 6.11. Two points can be noted. Substantial numbers of teachers of Year 8 mathematics and science spent only up to two hours of time during the five school days and weekend prior to completion of the questionnaire in lesson preparation and correction outside normal school hours (29 per cent and 19 per cent respectively). By contrast, a large number of teachers, about 20 per cent in each of the four samples, had spent nine hours or more in preparing for their lessons during this period.

The amount of time spent outside normal school hours by primary school teachers did not differ according to the type of school in which they taught. Primary school teachers in both government and Catholic schools spent, on average, about the same amount of lesson preparation time outside normal school hours. The situation was different among secondary school teachers. Teachers of Year 8 mathematics working in secondary high schools and Catholic schools spent about the same amount of time on lesson preparation outside normal schools. However, technical school teachers of Year 8 mathematics spent slightly less time than both these groups and teachers working in independent schools spent slightly more time on lesson preparation outside normal school hours. This trend was also evident among teachers of Year 8 science working in different types of schools.

Table 6.12 Amount of Responsibility for Various Aspects of Teaching Perceived by Teachers in Each Sample

	Perceived responsibility			
Aspect of teaching	Year 2 maths sample (median)[a]	Year 5 maths sample (median)	Year 8 maths sample (median)	Year 8 science sample (median)
Selection of topics for teaching	2.23	2.28	2.77	2.78
Selection of instructional materials	1.44	1.39	1.41	1.44
Sequence of learning units to give to students	1.30	1.34	1.63	1.45
Types of teaching practices to use	1.33	1.30	1.25	1.17
Use of achievement tests in the class	1.46	1.63	1.35	1.26
Specification of minimum requirements before students can progress to the next level of work	1.55	1.39	1.52	1.54

[a] Scale: (1) fully (2) to a large extent (3) to some extent (4) not at all.

The information concerning time spent in lesson preparation reported so far refers to lesson preparation for all subject areas taught by the teacher. Teachers were asked to indicate what proportion of this time was spent in lesson preparation for the specific class focused on in the questionnaire. Teachers in both primary school samples indicated that they spent approximately one-quarter of that time in preparing lessons in mathematics. Teachers of Year 8 science and Year 8 mathematics reported that they spent about one-fifth of their lesson preparation and correction time in preparing lessons for their Year 8 science classes or Year 8 mathematics classes. These results were found for lesson preparation done during allocated time and both during lessons and outside normal school hours.

Teacher Autonomy

The extent to which teachers were free to decide upon various aspects of their teaching is reported in Table 6.12. A number of trends are evident in these data. First, it appears that primary school teachers and secondary school teachers overall are either fully or largely responsible for their teaching. It was only in regard to the selection of topics for teaching that a large number of teachers did not hold major responsibility. About 42 per cent of primary school teachers in both samples indicated that they were responsible for the selection of topics either 'to some extent' or 'not at all'. This compares with about 63 per cent of secondary school teachers from both samples answering in a similar manner. Secondly, while many teachers did not have major responsibility for the selection of topics they taught, most teachers appeared to have major responsibility for the structuring of learning units within those topics.

Tables A.11 to A.13 in Appendix II contain a breakdown of teacher responses to these questions in terms of the type of school in which they worked. Several differences can be noted. First, at the primary school level, teachers working in Catholic schools seem to have greater responsibility for the selection of topics they taught than did teachers in government schools. This tendency was apparent at both the Year 2 and Year 5 levels.

Teachers of Year 8 mathematics also held different degrees of responsibility for the selection of topics according to the type of school in which they taught. Teachers in Catholic schools held greater responsibility in this regard than did teachers working in each of the three other types of school. A similar difference was found in regard to the selection of learning units to give to students. Differences in perceived responsibility between Year 8 mathematics teachers working in government high and technical schools were also apparent. Across all items, technical school teachers indicated that they held less responsibility for these aspects of their teaching than did high school teachers. In particular, the technical school teachers felt they held less responsibility for the use of achievement tests in the class (median 2.00) and the specification of minimum requirements before students could progress to the next level of work (median 2.24) than did high school teachers (median scores of 1.25 and 1.47 respectively). Similarly across all items technical school science teachers expressed the view that they held less responsibility for these aspects of their teaching than did high school science teachers.

Aims of School

The previous chapter presented information about what teachers believed should be the overall purpose of education. This section of the report is concerned with the teachers' perceptions of their schools' overall educational aims. As in the previous instance, teachers were asked to indicate the extent to which their school emphasized the development of skills and attitudes amongst students so that they might take their place effectively and competently in society. This was referred to as the societal aim of education. Teachers were also asked to indicate the extent to which their school emphasized the development of the students' individuality. This aim was referred to as 'fostering student individuality'. Teachers' perceptions of the emphasis of their school upon the societal aim of education are presented in Table 6.13. The emphasis of the school upon the fostering of student individuality can be calculated by subtracting the median score for the societal aim from five, the maximum possible score.

It is clear from Table 6.13 that the majority of teachers believed that their schools

Table 6.13 Emphasis Placed Upon the Societal Aim of Education by Schools Represented in Each of the Four Samples

Teacher sample	Schools' emphasis upon societal aim (median)
Year 2	3.24
Year 5	3.13
Year 8 mathematics	3.30
Year 8 science	3.32

[a] Median scores are calculated with a score of five reflecting maximum possible emphasis.

placed greater emphasis upon the fostering of the societal aim for their students compared with the development of student individuality. This was true for both primary schools and secondary schools. The extent of this difference in emphasis on the two aims can be gauged from examining the median scores of each. Typically the median score for the societal aim was about 3.2 and for the aim of fostering individuality about 1.8. This represents a substantial difference between the emphases given to these two educational aims.

There were small differences in the extent to which teachers from different types of schools believed their schools emphasized each of these educational aims. While at the primary school level there appeared to be little difference in Year 2 teachers' perceptions of the emphasis their schools adopted, among Year 5 teachers differences were more apparent. The median score for the societal aim among government primary school teachers was 3.20 compared with that among Catholic school teachers of 2.85. At the secondary school level, only one substantial difference emerged. Year 8 mathematics teachers working in technical schools believed that their schools emphasized the societal aim to a greater extent (median score of 3.70) than did Year 8 mathematics teachers working in each of the other three types of school. This difference was not apparent among teachers of Year 8 science working in different types of schools. Details of these results are reported in Table A.14 in Appendix II.

Mediating Influences: Summary

Five major elements of the instructional setting were examined in the survey. Each of these is relevant to the design of the correlational stage of the Classroom Environment Study. Classes differed considerably in size across each of the four samples investigated, and at the secondary school level there were substantial differences between the size of classes from different educational sectors. It would be of interest to examine the effects of class size upon the types of practices, and particularly management practices, adopted by teachers. In addition, analyses searching for interactive effects upon student learning between class size and teaching practices would seem appropriate, rather than merely controlling the effects of differing class size in searching for relationships between the teaching practices and student learning. The high frequency of composite classes at the primary school level presents a particular problem for the selection of classes to be investigated in the correlational study. If a random sample of Year 5 classes were selected, then it might be expected that about 40 per cent of classes would be composed of students of different year levels. The effects of composite classes upon student learning is largely unknown and it would seem better to select classes for the correlational study which were of a uniform year level. However, by so doing the study could not be generalized to a very large proportion of composite classes currently existing in Victorian primary schools.

The teaching arrangement across classes at different year levels was fairly uniform, with the majority of classes being taught by only one teacher. However, in a substantial group of Year 5 classes the teacher was assisted by another teacher, who was often a specialist teacher in mathematics. Therefore, in a random sample of, say, 80 Year 5 classes, one would expect students of about 18 classes to be taught by more than one teacher; in 12 of these 18 classes a specialist teacher would probably be assisting by taking individual students for specialist instruction for varying amounts of time. Since no information was collected during the survey about the number of students in these classes who received specialist instruction or the length of time given to such specialist instruction, the effect of this teaching arrangement upon the likelihood of discovering significant relationships between teaching practices and student learning is unknown.

Student ability level was the third element of the instructional setting examined in the survey. For the teaching of mathematics, with increasing year level there was a corresponding increase in the degree of differentiation of classes on the basis of student ability. Approximately one-fifth of Year 5 mathematics classes were composed of students whose teachers felt that they were, on average, lower in mathematics ability than most students in their age group. Among Year 8 mathematics classes this proportion had increased to nearly one-third. Only a small proportion of classes at all year levels were considered by their teachers to be higher ability classes. In the selection of classes for the correlational study, one might expect that, if primary school classes constituted the sample under survey, then the major source of variation in student ability would be within classes rather than between classes.

The findings concerning the amount of allocated time are particularly important for the design of the Classroom Environment Study. It cannot be assumed that classes selected in the correlational study will undergo the same, or even similar, amounts of instruction. There was wide variation between classes in regard to the amount of allocated time for the teaching of mathematics and science. This was characteristic of all year levels investigated. As was the case with class size, two approaches to studying the influence of allocated time (and actual instructional time) are warranted. First, it would be of value to investigate the relationship between amount of allocated time and the teaching practices adopted by the teacher. Secondly, analyses investigating the possible interactive effects of allocated time and teaching practices upon student learning would seem desirable.

The final element of the instructional setting comprised the content areas taught to students. The results of this aspect of the survey highlight a difficulty which faces the Classroom Environment Study. At the primary school level, some teachers tended to teach a large number of content areas throughout a school week; other teachers indicated that they taught only one or two content areas during the same period. Furthermore, it appeared from the questionnaire returns that not all students in the class were necessarily taught the same topics. This raises the difficulty of designing the experimental study in such a way that a uniform curriculum is taught and uniform achievement measures are used. Such a design could not be easily implemented in a sample of classes similar to that characterizing the present study. At best it might be possible to obtain agreement among teachers willing to participate in the experimental study to be guided by a uniform curriculum and to document, in detail, the amounts of time and relative emphases placed upon various topics within that curriculum.

Two aspects of resource allocation were measured in the survey: ancillary staff help and lesson preparation and correction time. The relevance of both to the Classroom Environment Study concerned the more widespread implementation of the proposed instructional model. It could be expected that teachers with heavy workloads and little assistance would be less likely to depart from their current teaching practices, especially if some of those practices involved increased testing of students, correction of their work, and closer supervision.

The workload of teachers in each of the four samples appeared to vary widely. This was most evident in the amount of lesson preparation and correction time allocated in the school timetable, with a large proportion of primary school teachers receiving no such time. Similar variations were observed in the amount of lesson preparation and correction time spent by teachers outside normal school hours. While some teachers found it necessary to spend very little time outside normal school hours in lesson preparation, a large number of teachers reported that they had spent nine hours or more outside normal school hours during the previous school week in the preparation of lessons. One could not reasonably expect this latter group of teachers to adopt a set of teaching practices which required an increased workload. However, it may well be that these teachers are already implementing many of the pratices suggested, and that an increased workload for them would not result.

Would teachers be free to adopt the proposed set of teaching practices? The survey findings suggest that they would. First, the results concerned with teacher autonomy indicated that teachers were largely responsible for most aspects of their job. In particular, they were generally fully responsible for the teaching practices they used. Secondly, the aims of the schools, in which teachers in the four samples taught, generally placed greater emphasis upon equipping students with skills which would enable them to fit more effectively into society. Conversely these schools placed less emphasis upon fostering student individuality. Such an overall purpose of education is congruent with the proposed instructional model when it is considered as a whole.

CHAPTER 7

TEACHING PRACTICES: RESULTS

The teaching practices adopted by teachers and the relationship of these practices to student achievement and attitude development are the major concerns of the Classroom Environment Study. This chapter describes the teaching practices used by teachers in each of the four samples. While several of the practices investigated in the present survey were not included in the set of teaching practices advanced for the Classroom Environment Study, they do provide the context in which the more specific teaching practices are used in schools. Five teaching practices were examined in the survey: time spent in various classroom teaching-learning activities, the presentation of instructional cues, the types of teaching materials used, the assessment methods employed, and the setting of homework. Information about these practices has relevance to the design of the experimental stage of the Classroom Environment Study: in particular, the development of the observation instrument, the prescription of the curriculum and associated instructional materials, and the determination of the possible influence of non-class learning time upon student achievement and attitudes, the dependent variables for the study. As has been the case in the previous two chapters, a description of the occurrence of these teaching practices is presented for each teacher sample separately. Where relevant, results are also presented in terms of the type of school in which teachers worked. In addition, descriptions are presented of the occurrence of teaching and learning activities in composite and non-composite primary school classes and in Year 8 science classes being taught different areas of science.

Classroom Teaching-Learning Activities

Teachers were asked to estimate the amount of time spent during lessons in various types of classroom activities. Teachers of mathematics at both the primary and secondary school levels estimated the occurrence of eight classroom activities; science teachers estimated the occurrence of nine classroom activities, eight being the same as those considered by teachers of mathematics. Four sets of results are examined in this section. The amount of time spent by teachers on each of the classroom activities during their lessons is described for each sample. This is followed by a brief examination of differences arising from the type of school in which teachers worked. It might be expected that different classroom activities characterized composite classes as distinct from non-composite classes, and this issue is investigated. Finally, the data collected from Year 8 science teachers are examined in terms of the major area of science being taught.

Table 7.1 Amount of Time Spent in Eight Types of Classroom Teaching-Learning Activities for Classes of Each of the Four Teacher Samples

	Amount of time			
Type of classroom activity	Year 2 maths sample (median)[a]	Year 5 maths sample (median)	Year 8 maths sample (median)	Year 8 science sample (median)
Whole class instruction	3.4	3.3	3.5	3.3
Small group instruction	3.7	3.8	4.2	4.4
Individual student instruction	3.9	3.9	3.4	4.3
Group work - written assignments	4.4	4.6	4.8	4.8
Group work - concrete materials	3.9	4.2	4.9	3.6
Student independent work	3.6	3.7	3.4	4.5
Student selection of activities	4.6	4.8	4.9	4.9
Peer tutoring	4.4	4.3	4.3	4.7

[a] Median scores are calculated using a 5-point scale: 1 - all the time to 5 - not at all.

The amount of time spent in eight types of classroom activities for classes of each of the four teacher samples is presented in Table 7.1. Teachers from the four samples generally indicated that during lessons about half the time was spent in taking all the students at once and teaching them directly. Teaching students directly would include lecturing students, teacher explanation, teacher-led discussion, and teacher demonstrations. This activity was the most frequently occurring activity in classes of Year 2 and Year 5 mathematics and in Year 8 science classes. Only for classes of Year 8 mathematics did teachers indicate that other activities occurred more frequently. Furthermore, in each of the four samples, there were substantial numbers of teachers who indicated that for most of the time during lessons they took the class as a whole and taught them directly. This number ranged from 20 per cent for Year 8 mathematics teachers to 25 per cent for teachers of Year 5 mathematics.

When teachers are not teaching the entire class at once, they may group students for the purposes of instruction. Three items were included in the Teacher Survey Questionnaire which examined the grouping practices adopted by teachers in the four samples. The first item was concerned with the teacher teaching small groups of students directly while the remaining students worked by themselves. This teaching practice was more characteristic of primary school classes than secondary school classes, although in neither case did the majority of teachers indicate that they used it for at least half the lesson time. Nevertheless, there were sufficient numbers of Year 2 and Year 5 teachers who indicated that teaching students in groups was a major classroom activity to warrant a more detailed examination of this teaching practice. When teachers group students, they may group students so that groups are fairly homogeneous in terms of ability or, alternatively, they may deliberately form mixed ability groups. It was therefore decided to ask those primary school teachers who had

Table 7.2 Proportion of Year 2 and Year 5 Teachers Grouping their Students for Most of the Time According to the Basis on which Student Groups are Formed

Grouping procedure	Proportion of teachers (%) Year 2 sample (N=26)	Proportion of teachers (%) Year 5 sample (N=19)
Students grouped into separate ability levels	65	58
Students of different ability levels grouped together	8	5
Both of these procedures	27	37

indicated in the Teacher Survey Questionnaire that they used this teaching practice most of the time on what basis they grouped students. Thirty-three Year 2 teachers and 30 Year 5 teachers had responded in this way. These 63 teachers were contacted by letter and asked to complete a short questionnaire requesting information about the grouping practices they employed.

Twenty-six Year 2 teachers and 19 Year 5 teachers responded to the letter. This response was considered satisfactory since the letter was sent in the last fortnight of the school year and no follow-up procedure was possible. Table 7.2 summarizes the findings from this survey of grouping practices. It is clear that with the small number of teachers comprising the samples only a limited interpretation can be placed upon these results. The majority of teachers in both samples indicated that students were grouped into separate ability levels for the purposes of instruction. In addition, some of these teachers at other times grouped students of different ability together for instruction. Few teachers responded that they only grouped students in such a way that students of different ability were together. Some teachers commented further on their grouping procedures and this proved useful. It would appear that student groups are often quite flexible in their composition, with group membership being dependent upon the topic being taught.

Teachers were asked to estimate the amount of time spent by small groups of students working together in class on written assignments set by the teacher. Among teachers from the four samples there was little use of this teaching method. However, there appeared greater use of group work involving students working together with concrete materials on tasks set by the teacher. For Year 8 science classes this teaching practice generally occupied a substantial amount of class time. In the case of science teaching, student use of concrete materials corresponds to practical work and it would seem that for slightly less than half the classroom time the majority of Year 8 science classes were involved in group practical work. By contrast, the use of concrete materials in a group situation for the teaching of mathematics was far less frequent. Only in regard to the teaching of mathematics to Year 2 students did a substantial number of teachers employ this teaching strategy for any more than a small amount of time. Thirty per cent of the Year 2 teacher sample indicated that their Year 2 students worked with concrete materials for at least half the class time, compared with 12.8 and 3.7 per cent for Year 5 and Year 8 mathematics teachers respectively. This compares with 47 per cent of Year 8 science teachers using this teaching strategy for a similar amount of time.

A fourth item concerned with group work was included in the Teacher Survey Questionnaire for the Year 8 science teacher sample. Science teachers were asked to estimate the amount of class time spent by small groups of students discussing topics and problems set by the teacher. Among this group of science teachers such a teaching method was quite infrequent at the Year 8 level (median value of 4.7).

In brief, the (direct) teaching of students in groups constituted a substantial teaching method only in the case of teaching mathematics to Year 2 and Year 5 students. It would appear that when such grouping does occur teachers usually group students of similar ability together. This grouping procedure may be augmented by mixed-ability grouping. Apart from the teaching of science, few teachers set work to be completed by groups of students working together. Rather, when students were grouped together, it was generally for the purpose of teacher-directed instruction.

The third approach to organizing the class for the purpose of teacher-directed instruction is to teach individual students separately while the remaining students work by themselves. This proved to be the most common teaching method used in the teaching of Year 8 mathematics. The majority of Year 8 mathematics teachers spent at least half their class time in this type of teaching activity. By contrast, few science teachers used this teaching method with their Year 8 students to any large extent.

While teachers take individual students separately for instruction, the remaining students work either by themselves or in groups. The extent to which group work occurred in each of the four samples has been discussed previously. Teachers were also asked to estimate the amount of time during lessons that students worked independently on exercises and assignments set by the teacher. Independent student work was most common in Year 8 mathematics classes and least common in Year 8 science classes. Among Year 8 mathematics teachers, 52 per cent indicated that for at least half the time their students worked independently on work they had set. By contrast 22 per cent of science teachers indicated a similar amount of independent student work. The occurrence in each of the four samples of the two remaining teaching practices investigated, namely: student selection of learning activities and peer tutoring, was extremely limited.

The major teaching and learning activities characterizing mathematics teaching at the Years 2, 5 and 8 levels and science teaching at the Year 8 level can now be summarized. For the teaching of Year 2 mathematics most time was spent in the following classroom activities:

- teacher taking all the students at once and teaching them directly,
- students working independently in class on exercises and assignments set by the teacher,
- teacher teaching small groups of students directly while the remaining students worked by themselves.

In addition to these three activities, teachers of Year 5 mathematics employed the following classroom activity:

- teacher teaching individual students directly while the remaining students worked by themselves.

Similar classroom teaching and learning activities characterized the teaching of Year 8 mathematics, although the order of frequency of occurrence differed:

- teacher teaching individual students directly while the remaining students worked by themselves,
- students working independently in class on exercises and assignments set by the teacher,
- teacher taking all the students at once and teaching them directly.

Finally the teaching of Year 8 science most often used the following two classroom activities:

- teacher taking all the students at once and teaching them directly,
- small groups of students working together on practical work set by the teacher.

As well as examining the use of each teaching practice separately, the overall sets of teaching practices characteristic of the four teacher samples were compared. D-scores were calculated as a means of testing profile similarity. The resultant D-scores were:

$$D_{\text{maths2 - maths5}} = 0.47$$
$$D_{\text{maths2 - maths8}} = 1.37$$
$$D_{\text{maths5 - maths8}} = 1.03$$
$$D_{\text{maths8 - science8}} = 1.97$$

Year 2 and Year 5 teachers of mathematics were most similar in their use of classroom teaching-learning activities as indicated by the low D-score (0.47). There appeared least similarity in use of these teaching practices between Year 8 mathematics teachers and Year 8 science teachers ($D = 1.97$).

Teachers were asked to stipulate the amount of time they had spent in the previous five school days teaching the class. The following question was asked:

Table 7.3 Amount of Time Spent in Eight Types of Classroom Teaching-Learning Activities for Composite and Non-composite Classes of Year 2 and Year 5 Teachers

	Amount of time			
	Year 2 classes		Year 5 classes	
Type of classroom activity	Composite (median)[a]	Non-composite (median)	Composite (median)	Non-composite (median)
Whole class instruction	3.0	3.5	3.4	3.3
Small group instruction	3.9	3.6	3.8	3.8
Individual student instruction	4.0	3.9	3.9	3.9
Group work - written assignments	4.3	4.5	4.6	4.6
Group work - concrete materials	3.6	4.0	4.1	4.3
Student independent work	3.4	3.7	3.8	3.6
Student selection of activities	4.4	4.7	4.8	4.9
Peer tutoring	4.4	4.4	4.2	4.4

[a] Median scores are calculated using a 5-point scale: (1) all the time - (5) not at all

How much time have YOU spent in teaching mathematics
to Year 5 students during the last 5 school days? ___ hours/minutes

As a measure of instructional time this item proved unreliable. It was evident from the responses that some teachers interpreted the question as asking for the amount of time they had spent in directly instructing their students and did not include student time in seat work or doing practical work. This probably arose as a result of an earlier question that had asked teachers to indicate the amount of allocated time for the class. In addition, a small group of primary school teachers stated that it was extremely difficult to estimate the amount of instructional time since much of the mathematics teaching was dispersed throughout other lessons, and some secondary school teachers included time spent preparing and correcting lessons for the class. For these reasons findings from the question have not been reported.

This concludes a consideration of the types of classroom teaching-learning activities employed by teachers in each of the four samples. Differences within samples according to whether teachers were taking composite classes or not, the types of subject matter taught, and the types of school in which the teachers work will now be examined.

Effects of Class Composition

The effect of teaching a composite Year 2 and Year 5 class compared with teaching a non-composite class at the same level is examined in Table 7.3. No substantial differences emerged between the separate analyses of the data derived from Year 5 teachers. When teaching mathematics to Year 5 students, the types of teaching

Table 7.4 Amount of Time Spent in Eight Types of Classroom Teaching-Learning Activities for Year 8 Science, According to Major Areas of Science Being Taught

Type of classroom activity	Major area of science			
	Biology (median)[a]	Physics (median)	Geology (median)	Chemistry (median)
Whole class instruction	3.1	3.6	3.1	3.5
Small group instruction	4.4	4.3	4.7	4.5
Individual student instruction	4.4	4.3	4.3	4.4
Group work - written assignments	4.8	4.8	4.9	4.9
Group work - concrete materials	4.0	3.2	3.9	3.0
Student independent work	4.4	4.6	4.5	4.6
Student selection of activities	5.0	4.9	5.0	4.9
Peer tutoring	4.8	4.8	4.8	4.7

[a] Median scores are calculated using a 5-point scale: (1) all the time - (5) not at all.

activities employed by the teacher did not seem to be affected to any large extent by the overall year level composition of the class. By contrast three differences emerged at the Year 2 level which warrant further investigation. First, Year 2 teachers of composite classes spent a greater amount of time taking the Year 2 students together and instructing them than did Year 2 teachers of non-composite classes. Correspondingly these teachers spent less time directly teaching small groups of students when these students were in composite classes rather than in non-composite classes. This might be expected, since in composite classes the Year 2 students already constituted a sub-group of the total class. The third difference which arose was quite unexpected: teachers in composite classes tended to set group work which required the use of concrete materials more often than did teachers of non-composite classes. However, it should be emphasized that these latter two differences which have been mentioned were not large.

Effects of Subject Area

The influence of the major area of science being taught upon the types of classroom activities the teacher chose to employ was investigated. There were sufficient numbers of science teachers who had taught in the four major areas of science to allow such an analysis of the data. The four areas of science were: biology, physics, geology and chemistry. Details of these analyses are reported in Table 7.4.

The most frequent classroom activities adopted for the teaching of biology were also adopted for the teaching of geology. The major emphasis in both these areas was upon whole class instruction, with only a small amount of time spent by students working together on practical exercises. The situation was quite different in regard to the teaching of physics and chemistry. When teaching physics or chemistry, teachers generally placed a great deal of emphasis upon practical work and spent less time instructing the class as a whole.

Effects of Type of School

The last analysis to be reported in this section concerns the question: Do teachers working in different types of school use different teaching practices? Tables A.15 - A.17 in Appendix II provide details of the use of each of the eight classroom activities in terms of the type of school in which the teachers worked. Several differences emerged which should be noted. However, before describing these differences it should be pointed out that overall there was close similarity in the use of these teaching practices by teachers working in different types of schools at the same year level.

While there were no substantial differences in the use of the eight teaching practices between Year 2 teachers working in government and Catholic schools, two differences were noted between the two groups of Year 5 teachers. Year 5 teachers working in Catholic schools indicated that they taught the entire class at once for more of the time than did teachers in government schools. In addition, Year 5 teachers working in Catholic schools indicated that their students were involved in more independent seat work than were Year 5 students in government schools. However, the use of group work, particularly involving the use of concrete materials, was less common among Year 5 teachers working in Catholic schools.

The pattern of teaching practices used by government technical school teachers for the teaching of Year 8 mathematics differed from that used by teachers in government high schools and Catholic schools. Technical school teachers, on average, tended to use whole class instruction less often, teach individual students more frequently, and set work for students to complete on their own more often than did teachers working in either government high schools or Catholic schools. There were no substantial differences in the amount of time spent in each of these classroom activities between teachers of Year 8 science working in different types of schools.

Instructional Cues

Four sources of instructional cues were examined in the survey. These were: (1) student reading of text and assignments, (2) teacher definition of exactly what was to be learnt at the beginning of the lesson, (3) teacher presentation of lesson summary at end of the lesson, and (4) student oral questioning and completion of tests. The extent to which each of these was considered by teachers as a source of instructional cues for their students is summarized in Tables 7.5 and 7.6. In general, the most common source of instructional cues for students of teachers in the four samples was the teacher defining exactly what was to be learnt at the beginning of each lesson. This most frequently

Table 7.5 Extent of Use of Four Types of Instructional Cues in the Classes of Each of the Four Teacher Samples

Instructional cue	Year 2 maths sample (median)[a]	Year 5 maths sample (median)	Year 8 maths sample (median)	Year 8 science sample (median)
	Extent of use			
Student reading of text and assignments	3.0	3.0	2.5	2.8
Teacher definition of objectives at start of lesson	2.3	2.3	2.5	2.8
Teacher presenting lesson summary at end of lesson	3.1	3.1	3.2	2.7
Student completion of tests and oral questioning	3.2	3.6	3.2	3.2

[a] Median scores are calculated using a 4-point scale: (1) Typical of all lessons - (4) typical of no lessons.

occurred among the primary school teachers and least frequently among the Year 8 science teachers. Approximately 58 per cent of Year 2 and Year 5 teachers indicated to their students in most of their mathematics lessons the objectives of the lesson, compared with 37 per cent of science teachers. The presentation of a lesson summary was less frequent, particularly in the teaching of mathematics. Lesson summaries were more characteristic of science teaching and 39 per cent of Year 8 science teachers indicated that they summarized at the end of most lessons what students should have learnt. The other source of instructional cues which seemed important was student reading of textbooks and learning assignments. This was more so for students at the secondary school level. Almost half the teachers of Year 8 mathematics and about one-third of Year 8 science teachers expected their students in most lessons to find out what they were to learn from reading the text and learning assignments.

Table 7.6 Proportion of Teachers in Each of the Four Samples Using the Four Types of Instructional Cues in at Least Most of their Lessons

Instructional cue	Year 2 maths sample (%)	Year 5 maths sample (%)	Year 8 maths sample (%)	Year 8 science sample (%)
	Proportion of teachers			
Student reading of text and assignments	18	21	47	34
Teacher definition of objectives at start of lesson	58	58	49	37
Teacher presenting lesson summary at end of lesson	18	22	20	39
Student completion of tests and oral questioning	9	8	13	8

Table 7.7 Amount of Time Spent by Teachers in Each of the Four Samples Using Eight Different Types of Instructional Materials

Instructional material	Year 2 maths sample (median)[a]	Year 5 maths sample (median)	Year 8 maths sample (median)	Year 8 science sample (median)
Textbooks	4.8	4.0	2.4	4.5
Curriculum packages	4.9	4.9	4.9	4.1
Teacher-prepared worksheets	2.8	3.2	3.5	3.7
Single theme materials[b]	N/A	N/A	N/A	4.7
Concrete materials/laboratory equipment	3.2	4.0	4.8	2.8
Chalkboard and overhead projector	2.3	2.2	2.3	3.3
Posters and displays	4.3	4.8	4.9	4.3
TV, films, radio	4.9	4.9	5.0	4.8

[a] Median scores are calculated using a 5-point scale: (1) all the time - (5) not at all.

[b] Only included in the survey of Year 8 science teachers.

Types of Teaching Materials Used

A major decision made by teachers is the type of instructional material to be used during a lesson. The survey examined teacher use of a wide variety of instructional materials and instructional aids. Instructional materials and aids define the content students are involved in learning and may comprise textbooks, curriculum packages, worksheets, single-theme books and concrete materials such as mathematical models and biological specimens. The chalkboard and overhead projector are also used by the teacher to define for the student what is to be learnt and to assist in the learning process. The use by teachers in each of the four samples of these instructional materials and aids during the five days prior to completion of the questionnaire is summarized in Table 7.7.

Among teachers of Year 2 mathematics considerable use was made of three of the instructional materials and aids listed. These were:

- the chalkboard and overhead projector,
- worksheets and assignments prepared by the teacher, and
- concrete teaching materials.

There appeared to be less emphasis placed upon the use of concrete teaching materials by Year 5 teachers although, in general, most teachers used them for a small amount of time during lessons. At the same time there was a slight increase in the use of mathematics textbooks by Year 5 teachers compared with Year 2 teachers. However, the major emphasis in the teaching of mathematics to Year 5 students was placed upon the use of:

- the chalkboard and overhead projector, and
- worksheets and assignments prepared by the teacher.

Table 7.8 Frequency of Assessing Student Performance in Terms of Marks or Course Grades by Teachers in Each of the Four Samples

	Frequency of assessing student performance (%)			
Frequency of assessment	Year 2 maths sample	Year 5 maths sample	Year 8 maths sample	Year 8 science sample
Never	5	4	2	2
Every couple of lessons	10	16	12	8
Every fortnight	13	17	40	15
Every month	32	36	41	54
1-5 times per year	40	27	6	22

The written materials used by the teacher and students at the Year 8 level in mathematics were quite different. Generally Year 8 mathematics teachers used textbooks as a basis for their lessons rather than teacher prepared worksheets and assignments. This use of textbooks was augmented by an extensive use of the chalkboard.

In brief, several trends in the use of instructional materials for the teaching of mathematics were evident. With increasing year level there was a greater emphasis placed upon the use of textbooks as a basis for learning and less emphasis upon teacher-prepared worksheets and assignments. Furthermore, with increasing year level the use of concrete teaching materials decreased.

The teaching of science by Year 8 science teachers was characterized by considerable use of laboratory equipment, specimens and other practical materials. A similar amount of time was typically spent using the chalkboard and overhead projector. From the information collected there appeared to be no predominant form of written instructional material used by science teachers at this level. Science textbooks were used by 20 per cent of the science teachers for at least half the class time. This compared with 39 per cent and 42 per cent of science teachers responding that they used, respectively, curriculum packages (such as ASEP or JSSP) or teacher-prepared assignments for a similar amount of the time during lessons.

Assessment Methods

The assessment methods used by teachers in the four samples were investigated in terms of: (1) the frequency of assessment of student performance, (2) the major assessment procedure used, (3) the frequency of diagnostic testing, and (4) the feedback and corrective procedures adopted.

Frequency of Assessing Student Performance

The frequency with which teachers from the four samples assessed the performance of their students in terms of marks or course grades is summarized in Table 7.8. Several

Table 7.9 Major Assessment Procedures for Allocating Marks Used by Teachers in Each of the Four Samples

	Use of assessment procedure (%)			
Assessment procedure	Year 2 maths sample	Year 5 maths sample	Year 8 maths sample	Year 8 science sample
(Short) tests	73	81	81	58
Exams	3	3	3	6
Project and assignment work	5	4	1	11
Tests and project assignment work	8	7	11	22
Other	11	6	3	2

points should be noted. First, only rarely were students at each of the three year levels not assessed at least once a year in terms of marks or course grades. Secondly, Year 2 teachers tended to assess their students' performance less often than teachers at other year levels: 40 per cent of Year 2 teachers responded that they assessed their students between one and five times per year compared with 27 per cent of Year 5 teachers, 6 per cent of Year 8 mathematics teachers and 22 per cent of Year 8 science teachers. Thirdly, Year 8 mathematics teachers assessed their students more often than teachers from each of the other areas with the majority testing their students at least every fortnight.

The frequency of assessing student performance differed according to the type of school in which teachers worked. The data for these comparisons are presented in Table A.18 in Appendix II. Teachers of mathematics at each of the three year levels who worked in Catholic schools tended to assess their students, together with the allocation of marks, more frequently than did teachers who worked in government schools. For example, at the Year 2 level 64 per cent of Catholic school teachers assessed their students at least monthly compared with 53 per cent of government school teachers; for Year 5 school teachers the proportions were 83 per cent and 64 per cent respectively. The differences in regard to the teaching of Year 8 mathematics were more pronounced. Of the Catholic school teachers in the sample, 74 per cent assessed their students at least fortnightly compared with 50 per cent of government technical school teachers and 42 per cent of government high school teachers. The proportion of teachers working in independent schools who assessed their Year 8 mathematics students at least fortnightly was 78 per cent. There was not a similar trend among Year 8 science teachers working in different types of schools.

Assessment Procedures Used

Teachers were asked to indicate the types of assessment procedures they used in assessing student performance. Their responses are summarized in Table 7.9 and show that the major assessment procedure used by teachers in general was a short test. About

Table 7.10 Frequency of Diagnostic Testing (without the Allocation of Marks) by Teachers in Each of the Four Samples (Percentage Recorded)

Frequency of diagnostic testing	Year 2 maths sample	Year 5 maths sample	Year 8 maths sample	Year 8 science sample
Never	17	9	30	50
Every couple of lessons	18	14	13	9
Every fortnight	4	8	10	7
Every month	12	16	11	9
1-5 times per year	49	53	36	25

80 per cent of teachers of Year 5 and Year 8 mathematics, and slightly less of Year 2 teachers, used short tests as their major assessment procedure. While substantially fewer science teachers stated that short tests comprised their major form of assessment, a considerable number responded that their assessment of student performance was mainly based upon a combination of short tests and project or assignment work. A brief comment is required concerning the 'other' category in Table 7.9. This category includes mainly combinations of the types of assessment procedures listed in Table 7.9. However, in the case of Year 2 teachers, most of those teachers whose responses were coded 'other' indicated that they based their student assessments upon daily observation of students at work.

Frequency of Diagnostic Testing

Teachers were asked the following question:

> How often do you use diagnostic testing and similar procedures for assessing the level of student understanding, without allocating marks or course grades?

The purpose of this question was to obtain some indication of the extent to which teachers used diagnostic testing in their classes, and the results are present in Table 7.10. Before examining the findings, a brief comment is required concerning the question asked. First, the question is quite open as to what constitutes a diagnostic test and some teachers may have included rather informal evaluative procedures in their estimate of the frequency with which they used diagnostic tests. Secondly, the question does not refer to the use of diagnostic tests with all students in the class. Therefore the frequency with which diagnostic tests were employed was based upon their use with at least some students in the class rather than with all students.

Teachers in all samples tended not to use diagnostic tests regularly. Furthermore, a large proportion of Year 8 science and mathematics teachers tended never to assess the level of student understanding without the allocation of marks or course grades. Thirty per cent of Year 8 mathematics teachers and 50 per cent of Year 8 science teachers indicated that they did not use such evaluative procedures. While the

Table 7.11 Feedback and Corrective Procedures Adopted by Teachers in Each of the Four Samples (Percentage Recorded)

	Use of feedback and corrective procedures			
Feedback and corrective procedure	Year 2 maths sample	Year 5 maths sample	Year 8 maths sample	Year 8 science sample
None	6	5	44	66
Specialized instruction	33	44	26	25
Specialized instruction and retested	61	51	30	9

proportion of teachers of Year 2 and Year 5 mathematics who never used diagnostic testing was far less (17 per cent and 9 per cent respectively), about half the teachers in each group responded that they used diagnostic testing only between one and five times per year in their class.

Feedback and Corrective Procedures

The final aspect of the assessment procedures used by teachers examined in the survey is concerned with what happens after students have completed tests, designed either for diagnostic or marking purposes, and the students' level of understanding is not high. This information is reported in Table 7.11 and substantial differences between the four groups of teachers are apparent. Rarely were no corrective procedures adopted by the two samples of primary school teachers. By contrast 44 per cent of Year 8 mathematics teachers and 66 per cent of Year 8 science teachers responded that students were not given any form of specialized instruction following a test. The primary school teachers on the other hand generally gave students whose level of understanding was not high specialized instruction and then tested the students again before they were allowed to proceed. While about one-third of the Year 8 mathematics teachers employed a similar corrective procedure, it was rarely adopted by science teachers in the sample.

Setting of Homework

As will be seen from the information presented in Table 7.12, there were differences between the four groups of teachers in regard to the setting of homework. With

Table 7.12 Proportion of Teachers in Each of the Four Samples who Set Homework for their Students

Teacher sample	Proportion of teachers setting homework (%)
Year 2 teachers	25
Year 5 teachers	62
Year 8 maths teachers	84
Year 8 science teachers	47

Table 7.13 Proportion of Teachers not Setting Homework who Indicated that they Believed Homework Should Be Set

Teacher sample	Proportion of teachers[a] (%)
Year 2 maths teachers	14
Year 5 maths teachers	48
Year 8 maths teachers	86
Year 8 science teachers	74

[a] For only those teachers who did not set homework to the majority of their students during the 5 school days prior to completing the questionnaire.

increasing year level more teachers of mathematics had set homework in the five school days prior to completing the questionnaire. Of those Year 2 teachers teaching mathematics, 25 per cent had set mathematics homework for their students compared with 62 per cent of Year 5 teachers and 84 per cent of Year 8 teachers. About half the sample of Year 8 science teachers indicated that they had set science homework during that period.

Generally, more teachers in Catholic schools set homework in these subject areas and at these year levels than did teachers in government schools. For example at the Year 2 level, 35 per cent of Catholic school teachers set mathematics homework compared with 21 per cent of government school teachers; at the Year 5 level the corresponding figures were 79 per cent and 58 per cent respectively. Similar differences emerged when the information collected from secondary school teachers was examined. A larger proportion of Year 8 mathematics teachers working in Catholic schools indicated that they had set mathematics homework for their students in the five school days prior to completing the questionnaire than did Year 8 mathematics teachers working in either government high or government technical schools. This trend was also evident in the data obtained from teachers in the Year 8 science sample. Details of these analyses are contained in Table A.19 in Appendix II.

Teachers who had not set homework during the five school days prior to completion of the questionnaire were asked to indicate whether they believed mathematics (or science) homework should be set. The information obtained is summarized in Table 7.13. The results recorded in response to this question are interesting. While the great majority of secondary school teachers who had not set homework felt that it should be set, such was not the case among the two groups of primary school teachers. Only 14 per cent of Year 2 teachers in this group indicated that they believed mathematics homework should be set for Year 2 students; 48 per cent of Year 5 teachers responded in a similar manner. It would appear that there is a large group of Year 2 primary school teachers, and to a lesser extent Year 5 primary school teachers, who do not consider that mathematics homework should be set for their students.

Table 7.14 Amount of Mathematics Homework Set During the Previous Five School Days by Teachers from Each of the Four Teacher Samples (Median Scores Recorded)

Teacher sample	Amount of mathematics homework set (minutes)[a]
Grade 2 maths teachers	32
Grade 5 maths teachers	58
Grade 8 maths teachers	73
Grade 8 science teachers	58

[a] The amount is calculated on the basis of the median scores for each sample of teachers, not including those teachers who had not set homework in the five school days prior to completion of the questionnaire.

Teachers were asked to estimate the amount of time it would have taken the average students in their class to complete the mathematics homework set during the previous five school days. This information, collected from the teachers who had set homework during that period is presented in Table 7.14. As in the case of the previous estimates of time, data reported here were obtained only from those questionnaires completed by teachers in the second week following the public holiday. However a comparison of these data with data derived from teacher questionnaires completed in the previous week showed little difference in information recorded. Therefore, again it can be argued that teachers based their estimates on the previous five school days, not including the public holiday which some schools received.

The average amount of mathematics homework set by teachers varied according to the year level of the students concerned. Teachers of Year 2 who set mathematics homework indicated that on average their students would have spent about 32 minutes completing mathematics homework during the previous five school days. This compared with students of Year 5 having spent an average of 58 minutes and Year 8 mathematics students an average of 73 minutes during the same period. In general, teachers of Year 8 science indicated that the average student in their classes would have spent about 58 minutes completing homework set during the five school days prior to completion of the questionnaire.

The range in the amount of homework set was extremely wide at all year levels. Some teachers had set as little as 10 minutes homework for students to complete during the period of five school days. This was found in the four samples concerned. On the other hand, the maximum amount of mathematics homework set for this period varied between 120 minutes for Year 2 students and 300 minutes for Year 8 students. The maximum amount of science homework set was 180 minutes.

Teaching Practices: Summary

Four major instructional activities characterized the teaching of mathematics at the year levels under investigation. The most common of these was the teacher taking the entire class at once and teaching them directly, and this was particularly characteristic of primary school classes. Three other types of class organization frequently occurred, two of which also related to teacher-directed instruction. Teachers in Year 2 and Year 5 classes tended to teach small groups of students while the remaining students worked by themselves. This form of instruction occurred infrequently in the teaching of Year 8 mathematics. Mathematics teachers at this year level instructed individual students separately. This variation in class organization for the purposes of instruction has important implications for the design of the observation schedule for use in the correlational study. An instrument which focuses upon teacher-student interactions in a detailed manner would be more suited to teaching situations where the teacher was instructing the whole class at once. The same instrument would be extremely difficult to apply to the situation where the teacher spent most of the time instructing individual students separately, as was the case in many Year 8 mathematics classes. For example, in this latter teaching situation an observer would be unable to code the cognitive level of many of the questions asked by the teacher (or student) because of an inability to hear the questions clearly. The problem would be further increased if the observer attempted to code sequences of teacher-student interactions. Similar difficulties might occur if the teacher spent a considerable amount of time moving about the class instructing small groups of students, or, in the case of science teaching, where most students spend a considerable amount of time in small group practical work.

The important point which emerges from an examination of the instructional activities used by teachers is that there is considerable variety in their use both between teachers and by teachers throughout the course of their lessons. This reaffirms the need to be able to relate the teachers' use of specific teaching behaviours with their use of more global instructional activities, for it may well be that there is an interactive effect between the use of particular teaching behaviours and instructional activities upon student learning.

The effects of class composition, area of science being taught and type of school upon the occurrence of each of the classroom activities were investigated. Only in the case of the area of science being taught did major differences in the use of activities occur: chemistry and physics were more practical-work oriented, biology and geology more oriented towards whole class instruction.

From an examination of the teaching materials used by teachers in each of the four samples, the selection of a uniform curriculum for the experimental study may prove difficult. Many teachers prepare their own learning assignments for their students rather than use textbooks or curriculum packages. Hence, while it may be possible to gain agreement from a group of teachers to adopt the same set of curriculum aims or guidelines, the implementation of that curriculum in the classroom is likely to differ. To overcome this disparity, teachers in the experimental study may be required to document the teaching materials they use in relation to particular curriculum aims.

Information was collected in the survey which directly related to the proposed instructional model: instructional cues, student assessment, and feedback and correctives. The most common source of instructional cues for students of teachers in each of the four samples was the teacher defining exactly what was to be learnt at the beginning of each lesson. The other major source of instructional cues for these students was in the form of lesson summaries and this was particularly frequent among science teachers. It would be of interest in the correlational study to examine in detail the amount and specificity of instructional cues presented by teachers, and the perceptions of these cues by students in the class.

The frequency of assessing student performance, together with the allocation of marks or course grades, relates to the development of a climate of competitiveness in the classroom. This was one of the teacher management practices, suggested in the research proposal, which positively influences time-on-task and student learning. With the exception of the Year 2 sample, there was frequent testing of students by the three remaining groups of teachers. Most testing occurred in the teaching of Year 8 mathematics where the majority of teachers tested their students fortnightly. Furthermore, it was found that the frequency of testing differed according to the type of school in which the teacher worked, more frequent assessment occurring in Catholic schools and less frequent assessment occurring in government schools. By contrast, teachers in all samples tended not to use diagnostic tests regularly.

The use of correctives following assessment differed markedly across the four samples. Only in the case of the primary school samples did the majority of teachers give students, whose test performance was not satisfactory, specialized instruction followed by another test before allowing them to proceed.

The present survey examined the use of formal assessment and feedback and corrective procedures and in some classes these would appear to occupy a substantial amount of instructional time. It will be important during the correlational study to gain some estimation of the actual time spent assessing students and correcting misunderstandings. This would augment the observational data collected that was concerned with less formal feedback and corrective procedures which occur throughout classroom lessons as part of teacher questioning and discussion.

The final teaching practice investigated in the survey was the setting of homework. With increasing year level there was a corresponding increase in the proportion of teachers who set homework, as well as the average total amount of homework set. However, there was a wide range across classes at each year level in the amount of homework set by teachers. This could necessitate in the correlational study controlling for the influence of homework upon student learning.

The setting of homework has not been investigated in many of the studies of teacher effectiveness during recent years. Yet it raises a number of important issues concerned with total time-on-task, the correction of homework and the integration of homework into the lesson. There appears sufficient variation in this teaching practice at the year levels investigated in the present survey to warrant a more detailed examination.

CHAPTER 8

TEACHING AND LEARNING IN VICTORIAN CLASSROOMS

The Study in Perspective

This report is concerned with the findings of the first phase of a very substantial inquiry that seeks to investigate the teaching and learning practices that occur in Victorian classrooms. The study as a whole extends beyond the work of describing the context of the teaching and learning of mathematics and science in our schools, since in the second phase it will examine relationships between key teaching and learning practices and educational outcomes measured in terms of student achievement and attitudes. In the third phase attempts will be made by means of inservice education programs to change the way in which teachers behave in the classroom, and then to examine the effects of these changes in teacher behaviour on what students do as well as on their performance. Each phase of this study is part of a sequence, and it is evident from this first report that it would have been unwise to embark on an experimental investigation in the third phase without having previously carried out the first and second phases concerned with the description of teaching practices and the correlation of those practices with educational outcomes.

It is important to recognize that not only is the first phase of this study an initial stage of a substantially larger investigation, but it also opens up a new and necessary field of inquiry in Australian education. Until relatively recent times, the teaching and learning practices like the curriculum of the schools have, in the main, been greatly influenced if not determined by the policies laid down within the central administration of the education departments responsible for the provision of education in the government schools of each State. The curricula of the schools were previously presented in guidebooks issued by the departments, and the formal curricula greatly influenced many of the practices of teachers in the schools. Perhaps the most directly influenced practice was that associated with the time which was formally laid down for the teaching of the subjects of mathematics and science at successive year levels of schooling. However, with a weakening of the requirement on teachers to follow a prescribed curriculum, far greater range of possibilities has entered into the teaching which takes place in schools. In addition, it is important to recognize the influence that the teacher training institutions and the inspectorial services exerted on the behaviours of both teachers and students in the classrooms. The inspectors were in a position to ensure that certain practices, which were believed to be desirable for effective learning, were followed and, during the years of teacher training, the same practices were taught to student teachers by lecturing staff who were employees of the education departments. In little more than a decade the long-standing traditions established by the inspectors and the teachers college lecturers have disappeared as the inspectors have been replaced by advisers and the teachers colleges have become largely autonomous colleges of advanced education employing their own staff. There is the possibility that the teaching and learning practices in the classrooms have changed. Whether these changes have been for better or for worse is an empirical question. Unfortunately, it is also a question that cannnot be readily answered. In part, an answer cannot be given because so little is known about what teachers and students do in schools at the present time, or indeed about what they did in the past, although the practices of the past could perhaps be inferred from the guidebooks and manuals that were formerly used. However, it is also important to achnowledge that answers cannot be given because so little is known about which teaching and learning practices result in effective learning by students in the classroom. Consequently, the correlational and experimental phases of this investigation are important steps in an attempt to identify from the variety of possible teaching and learning behaviours those that contribute to effective learning and those that do not.

In summarizing the findings of the first phase of the investigation being undertaken, and that part of the study which has been reported in this volume, it will not be possible to indicate which behaviours of teachers should be noted and followed, but only to show the range of teaching practices that occur in Australian classrooms at different levels of schooling. In addition, it is of value, where possible, to raise the issues concerned with whether evidence exists to support one practice in preference to another and under what conditions a particular practice is effective, and whether the following of a particular practice is amenable to investigation to determine the consequences of the practice for agreed-upon educational outcomes.

The Survey

In the first phase of the Classroom Environment Study, a Teacher Survey Questionnaire was administered to four samples of teachers in Victorian schools during the third school term in 1980. Since the study was primarily concerned with the teaching and learning of mathematics and science, only mathematics and science teachers were included in the samples. The survey was designed in order to obtain information on the views of samples of teachers of mathematics at Year 2 and Year 5 in the primary school, and teachers of both mathematics and science at Year 8 in the secondary schools. The study was limited to Victorian schools, because it would only be possible to undertake the subsequent observational work in schools in the Melbourne metropolitan area. Consequently the sampling procedures were planned to select schools with a probability proportional to size at the first stage of sampling, and at the second stage of sampling to obtain information from all teachers at a chosen school, who were within the defined target population. The response rates from teachers and schools of all types were good, and replies were received from approximately 80 per cent of the teachers in the designed samples. Because the samples that were designed involved schools at the first phase of sampling, drawn with a probability proportional to size, and because the numbers of teachers responding differed between schools, it was necessary to weight the data collected in order to obtain frequency distributions for the different items under survey. In examining the data collected in order to identify differences between groups that were worthy of comment, relatively crude screening procedures were employed associated with a probability level of approximately 5 per cent, but these did not take into consideration either the clustering of teachers within schools or the examining of the same body of data for multiple comparisons.

The First Phase of the Classroom Environment Study

This report on the first phase of the Classroom Environment Study makes a contribution to the later phases of the study. In the summaries at the conclusion of the substantive chapters, as well as throughout the body of the text, some of the issues concerned with the planning of the correlational and experimental phases have been addressed. The inference that may safely be drawn, from what has been presented so far, establishes that any investigation into teaching and learning practices is necessarily complex. The context within which such a study must be carried out is multi-faceted, and it may not be possible to control statistically for the many different factors operating in a correlational analysis, or to control by a design which involves satisfactory randomization in an experimental study. Nevertheless, the complexity of the situation should not be permitted to prevent research from proceeding in a rigorous way that allows sound quantitative evidence to be collected and that enables meaningful analyses of data to be carried out. What is being sought through this investigation is a soundly established scientific basis for both teaching and learning in schools and this will only be achieved by systematic and cumulative inquiry.

The warnings provided in this report have been followed in the design of the correlational phase. The subject area of mathematics has been preferred to that of science because the investigation would quite clearly be more straightforward. The Year 5 level has been chosen because there is more stability in teaching practices and because this tends to be the year level where students are expected to become proficient in formal operations. Consequently Year 5 is a key stage in the mathematical development of students. In addition, the curriculum being taught is more straightforward and, as the evidence suggests, there is more systematic testing of student learning and more specialized instruction following the diagnosis of deficiencies in learning. Moreover, there is a high level of acceptance by teachers of the importance of learning the basic skills of computation and learning to use common measures, as well as the need to develop an ability to apply mathematical ideas and skills to real-life situations. There are, however, many difficulties encountered in the undertaking of a study at this year level in the natural classroom setting. From this first investigation, it might be expected that approximately 40 per cent of the classrooms selected for later study will comprise composite classes, and to exclude such classes from the observational phase would distort the inquiry significantly from what is found in real life. Furthermore, in only about 75 per cent of the mathematics classrooms at the Year 5 level does the class teacher have sole responsibility for the learning of mathematics that occurs. In the remaining 25 per cent of classrooms this responsibility is shared with one or more persons, and this degree of joint responsibility is greater at the Year 5 level in mathematics than at other year levels under survey. However, it is important to note that more time, on average, is given to learning mathematics at the Year 5 level than is given to science or to mathematics at other year levels. Furthermore, at the Year 5 level, there are very few teachers (only 13 per cent) who give very little time (between 0 and 2 hours) to lesson preparation and correction. Thus it would appear that teachers at this year level would be more willing to undertake a commitment to an experimental investigation, that would clearly involve them in additional work.

In the planning of the observational work at the Year 5 level it would be important to recognize that there were four main types of teaching activity in which teachers said they engaged, namely:

1 teacher taking all students alone and teaching them directly,
2 students working independently in class on exercises and assignments set by the teacher,
3 teacher teaching small groups of students directly while the remaining students worked by themselves, and
4 teacher teaching individual students directly while the remaining students worked by themselves.

Not all four types of activity would be equally amenable to systematic observation and, in so far as a teacher emphasized one activity in preference to or at the exclusion of other activities, then the more specific teaching and learning behaviours observed in the classrooms would differ. It is important that the classroom observation instrument used should be sensitive to the different teaching behaviours and appropriate to the various types of activity. However, it should be noted that there was little evidence reported that indicated that the type of teaching-learning activity undertaken by the teachers differed between composite and non-composite classes.

There was little doubt after reviewing the evidence assembled that a study involving Year 5 mathematics classes was to be preferred to the other options available. During 1982 such an inquiry was carried out in 75 classrooms in Victorian government schools as the second phase of the Classroom Environment study. The problems that were foreseen were met nore satisfactorily with advance knowledge of their existence and, as a consequence of the careful and thorough planning that had occurred, sound data were collected.

Concerning Victorian Classrooms

In the concluding pages of this report a summary is provided of features of interest found to occur in Victorian classrooms. The features discussed have been grouped under the three main headings used in the model which underpinned the development of the Teacher Survey Questionnaire: teacher characteristics, mediating influences, and teaching processes.

Teacher Characteristics

The first major finding was the difference between the teachers in the government schools and the teachers in the Catholic schools in the emphasis that they placed on the broad educational aims of schooling. Teachers in the government schools tended to view as more important the societal aims of schooling concerned with helping to equip students with the skills and attitudes which would enable them to take their places effectively and competently in society, fitting them to make choices of occupational roles and to live harmoniously in the community. Teachers in the Catholic schools tended to view as more important that the purposes of primary and secondary education were to foster the development of the children's individuality and independence enabling them to discover their own talents and interests, to find a full enjoyment of life in their own way, and to arrive at their own attitudes towards society.

Whether the views expressed by the teachers in the samples in this regard were consistent with the acknowledged policies and goals of both the Victorian Education Department and the Catholic Education Office in Victoria is not known and, while the differences between the two systems were not large, it is of some interest that the two groups of teachers would appear to have expressed different views of the aims and goals of education.

In the teaching of mathematics at the Year 2, Year 5, and Year 8 levels, the most important curricular aims of teachers were quite clearly those associated with the development of basic skills in computation and the use of common measures. The second most important aim was concerned with the development of an ability to apply mathematical ideas and skills to real-life situations. Whether the former should remain an important aim of mathematics teaching at a time when calculators are so readily available is an unresolved question. In the teaching of science, the emphasis that teachers considered should be placed on the development of skills in practical investigation, including the use of laboratory equipment, was only marginally below that concerned with the acquisition of a basic knowledge about a wide range of scientific concepts.

Of some concern in the teaching of mathematics at the Year 2, Year 5, and Year 8 levels was the relatively low degree of emphasis placed by teachers on the setting of 'higher order' exercises. This would seem to indicate that in the teaching of mathematics, particularly at the Year 8 level, there was less emphasis on the development of skills of problem-solving than on the doing of practice exercises. Likewise in the teaching of science, a greater emphasis on the setting of 'higher order' exercises might have been expected as would be consistent with a major goal associated with the development of skills of practical investigation.

It was clear from the evidence collected in the survey that the majority of mathematics teachers, particularly those teaching Year 5 and Year 8 students, emphasized the teaching of basic mathematical skills. Nevertheless, there was considerable variation between individual teachers in regard to the aspects of mathematics teaching that they viewed as important.

Mediating Influences

The evidence obtained from the survey, that approximately 30 per cent of students at the Year 2 level and 40 per cent of the students at the Year 5 level were in composite classes in Victorian primary schools, leads to the question of whether this is an appropriate arrangement for effective teaching. Is it a practice that is forced upon schools out of a desire to hold the size of classroom groups of students at an agreed-upon level, or is it a situation that arises from an interest in vertical grouping and a wish to establish more flexible classroom structures? It is possible that the setting up of composite classes places a greater burden on the classroom teacher, but this is clearly not recognized in Victorian schools because class sizes are approximately the same at both year Year 2 and Year 5 levels for both non-composite and composite classes.

The different teaching arrangements that are in operation in Victorian schools are of some interest. The use of specialist teachers to assist with the teaching of mathematics in approximately 10 per cent of mathematics classes at all three year levels would seem to indicate that some recognition is being given to the provision of remedial teachers. However, the practices of providing more than one teacher where the teachers take the whole class, but at different times, in one mathematics class out of 40 and one science class in 25, are perhaps open to question. While there was little evidence available from the survey of streaming practices in schools, there was some evidence that teachers of higher year levels were more likely to view the students in their classes as being of lower ability than most students in their age group. The effects of composite classes, class size, the use of remedial or specialist teachers, joint responsibility for a class group, and the setting up of classes of lower ability students on teacher and student learning behaviours are not known, and are clearly questions which could well be addressed in the correlational phase of the Classroom Environment Study. There are two issues of interest. First, do these classroom arrangements place a greater burden on the classroom teachers, and secondly, does learning take place more or less effectively under such arrangements or are these arrangements of such a nature that they have no recognizable effect on student learning?

Allocated Time

One factor that is known to have a significant influence on student learning (see, for example, Keeves (1968) for Australian evidence and Borg (1980) for a review of evidence from many sources) is the amount of time allocated to the learning of mathematics and science in the classroom. However, it was of some surprise to learn from the Teacher Survey Questionnaire, that not only were there sizable variations in the average time allocated to mathematics across the year levels, with approximately 240 minutes per week at Year 2, 270 minutes per week at Year 5, and 225 minutes per week at Year 8, but there were very striking variations within each year level. At Year 2, the allocated time ranged from 120 minutes per week to 420 minutes per week. At Year 5, the time made available ranged from 120 minutes per week to 540 minutes per week, and at Year 8, from a minimum of 86 minutes per week to a maximum of 600 minutes per week. These differences in time allocated for teaching mathematics might be expected to give rise to very significant differences in level of student performance in mathematics, and perhaps to substantial differences between class groups in attitudes to the learning of mathematics. It is necessary to consider whether the needs of students are such as to warrant these wide differences in time allocated to the learning of mathematics, or alternatively whether the disparities arise from differences in the perceptions of classroom teachers or school administrators with regard to the relevance of mathematics and its importance in relation to other subjects in the school curriculum.

Information was also obtained on teacher practices in the setting of homework and the amount of time expected for mathematics homework per week. At the Year 2 level, 25 per cent of teachers set homework for the students and the median time expected to complete the homework set by these teachers was 32 minutes per week. At the Year 5 level, 52 per cent of teachers set homework for their students and expected, as a median value, that their students would take 58 minutes per week to complete this work. At the Year 8 level, 84 per cent of mathematics teachers set homework and expected that approximately an hour and a quarter (73 minutes) per week would be required to complete this work. However, at the Year 8 level, slightly less than half of the science teachers set homework (47 per cent) and expected that this work would require approximately an hour (58 minutes) per week. The gradual increase in the proportion of teachers setting mathematics homework across the year levels from Year 2 to Year 8 is not surprising, nor is the increase in time expected per week. However, it is of some interest that such a high proportion of Year 2 and Year 5 teachers set homework, but that such a low proportion of Year 8 science teachers set homework. It is clear that the setting of homework is a question about which teachers differ markedly. Whether policies and practices in this area should be decided at the system, school or individual teacher level is unclear. What is evident is that in Victorian schools there are widely different views on both the importance of mathematics in the school curriculum and the importance of homework as a contributing factor towards the successful learning of mathematics. The questions that must be considered are whether some students are being disadvantaged in their later education as a consequence of the policies and practices of individual teachers and schools, and whether some students develop a negative reaction to the learning of mathematics as a consequence of excessive time given to the study of this subject.

Teaching Practices

A further area in which there were wide differences between teachers in Victorian schools is concerned with assessment practices. At all year levels under survey and in both mathematics and science, there were some teachers, approximately five per cent, who never assessed the performance of their students by awarding marks. There were also substantial proportions, 40 per cent at Year 2, 27 per cent at Year 5, 6 per cent at Year 8 in mathematics, and 22 per cent at Year 8 in science, who only assessed student performance between one and five times per year. On the other hand there were some teachers who gave a test every couple of lessons, a practice that was more common in mathematics than in science, and significant numbers of mathematics teachers at Year 8 level (40 per cent) who assessed student performance once a fortnight. It would be of some interest to know whether the differences recorded are a consequence of differences in the policies of schools or whether they are differences in the practices of individual teachers.

Moreover, it is of some interest to note that significant numbers of secondary school mathematics teachers (44 per cent) and science teachers (66 per cent) stated that they did not provide any feedback and corrective procedures to their students after testing. At the primary school level, practices associated with feedback and corrective procedures were more frequently practised as was subsequent retesting to determine whether deficiencies had been remedied. The evidence presented would seem to indicate that teachers hold widely differing views about the relevance and importance of assessment as well as about whether corrective procedures are effective in order to increase learning. While it would seem that there are not ideal practices, or practices that produce optimum benefits, the views of teachers in this area would seem to vary considerably.

Conclusion

The information on teachers' views and practices presented in this report was obtained from questionnaires answered by the teachers in the groups under survey. This information has produced findings of considerable interest, although some may question the validity of self-report data collected under survey conditions. Consequently it is important that the second and third phases of this investigation should be carried out in order that a more detailed picture of learning practices in Victorian schools can be achieved. Information gathered by observation and by interview is likely to have greater validity than that obtained by survey. Moreover, it is possible to collect data on more specific student and teacher behaviours through these more direct methods. While the cost of the second and third phases of the investigation are likely to be substantial, the nature and quality of the data collected would appear to warrant the expenditure. It is to be expected that further reports from this investigation will not only provide information which is complementary to that presented here, but will also tell something of the consequences of the different teaching and learning practices for increasing student achievement and changing student attitudes to school and school learning.

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APPENDIX I

The Australian Council for Educational Research Limited

CLASSROOM ENVIRONMENT STUDY: TEACHING FOR LEARNING

This survey is concerned with how teachers teach mathematics in primary schools. It forms part of an international study of teaching in fourteen countries. All the information obtained will be treated as CONFIDENTIAL. Please take care to answer each question.

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1. YOUR BACKGROUND

(a) How long in total have you been teaching? (Only count actual years in which you have been teaching)	____ years
(b) How long have you taught upper primary school mathematics?	____ years
(c) How long have you been in your present school?	____ years

2. ABOUT YOUR CLASS

(a) What is the composition of the class in which you are teaching mathematics to Grade 5 students?	☐ Grade 5 students only ☐ Grade 4 and 5 students combined ☐ Grade 5 and 6 students combined ☐ Grade 4, 5 and 6 students combined
(b) How many students are there in the class? (If composite, include all students)	____
If a composite class, how many students are in Grade 5?	____
(c) In your opinion, are the Grade 5 students in this class:	☐ about the same in maths ability as most students in their age group ☐ lower in maths ability than most students in their age group ☐ higher in maths ability than most students in their age group
(d) Are you the only teacher who takes this class in mathematics?	☐ Yes ☐ No
If no, please indicate the type(s) of teaching arrangement:	☐ More than one teacher takes the entire class at the one time ☐ More than one teacher takes the entire class, but at different times ☐ A specialist teacher teaches individual students from the class at various times
(e) How much time each week is allocated to this class for studying mathematics? (Include total time, not just time taught by you)	____ hours/minutes
On average, how many maths sessions each week are there included in this total time?	____

3. EXTRA HELP YOU RECEIVE

Do you usually make use of ancillary staff for the preparation of materials?	☐ Yes ☐ No – assistance is not available ☐ No – but assistance is available

4. WHAT YOU ARE CURRENTLY TEACHING

Please list the mathematics topics you have been teaching to your Grade 5 students during the last 5 school days.

5. YOUR TEACHING METHODS

Please consider carefully how you have taught mathematics to Grade 5 students over the last 5 school days. We have listed some different types of teaching methods. These methods include directly instructing students, setting learning assignments and giving students the opportunity to select their own learning activities. We are interested in how much time you have spent in different types of activities. If you are teaching a composite class, please consider only your teaching of Grade 5 students.

(a) How much time have YOU spent in teaching mathematics to Grade 5 students during the last 5 school days?

______ hours/minutes

(b) During this period of time, please estimate the amount of time spent in the following activities while teaching mathematics to Grade 5 students.

	All the time	Most of the time	About half the time	A small amount of time	Not at all
Teacher taking all the students at once and teaching them directly	☐	☐	☐	☐	☐
Teacher teaching small groups of students directly while the remaining students work by themselves	☐	☐	☐	☐	☐
Teacher teaching individual students directly while the remaining students work by themselves	☐	☐	☐	☐	☐
Small groups of students working together in class on written assignments set by the teacher	☐	☐	☐	☐	☐
Small groups of students working together with concrete materials on work set by the teacher	☐	☐	☐	☐	☐
Students working independently in class on exercises and assignments set by the teacher	☐	☐	☐	☐	☐
Students (or groups of students) working on learning activities they have been allowed to select	☐	☐	☐	☐	☐
Students of higher ability helping those of lower ability (peer tutoring)	☐	☐	☐	☐	☐

Please tick a box in each row

(c) Students find out what they are expected to learn in a variety of ways. Consider your teaching over the last 5 school days.

How did your students find out exactly what they were expected to learn?	Typical of all lessons	Typical of most lessons	Typical of some lessons	Typical of no lessons
From reading the text and/or completing exercises and worksheets	☐	☐	☐	☐
By the teacher defining exactly what was to be learnt at the beginning of each lesson	☐	☐	☐	☐
By the teacher summarizing at the end of the lesson what they should have learnt	☐	☐	☐	☐
From doing tests and short quizzes	☐	☐	☐	☐

Please tick a box in each row

6. THE TYPES OF TEACHING MATERIALS YOU USE

In this section of the survey we are interested in the teaching materials you use in teaching Grade 5 maths.

To what extent over the last 5 days have you used the following teaching materials?	All the time	Most of the time	About half the time	A small amount of time	Not at all	Item not available
Text-books such as 'Continuous Progress in Mathematics'	☐	☐	☐	☐	☐	☐
Curriculum packages such as IMP (Individual Mathematics Program)	☐	☐	☐	☐	☐	☐
Teaching materials such as fraction kits, MAB blocks and measuring blocks	☐	☐	☐	☐	☐	☐
Worksheets and assignments prepared by the teacher	☐	☐	☐	☐	☐	☐
To what extent over the last 5 days have you used the following teaching aids?						
Chalk board and overhead projector	☐	☐	☐	☐	☐	☐
Mathematical posters and displays	☐	☐	☐	☐	☐	☐
Television, radio and film	☐	☐	☐	☐	☐	☐

Please tick a box in each row

7. ASSESSMENT METHODS

(a) How often do you assess the performance of students in terms of marks and course grades?

☐ never
☐ every couple of lessons
☐ every fortnight
☐ every month
☐ 1-5 times per year

(b) What is the major assessment procedure used for the allocation of marks and course grades?

☐ (short) tests
☐ exams
☐ project and assignment work
☐ other: please specify ____________

(c) How often do you use diagnostic testing and similar procedures for assessing the level of student understanding, without allocating marks or course grades?

☐ never
☐ every couple of lessons
☐ every fortnight
☐ every month
☐ 1-5 times per year

(d) What usually happens after students complete a test, designed either for diagnostic or marking purposes, and their level of understanding is not high?

☐ they proceed to the next topic with the other students in their class
☐ they are given specialized instruction and then allowed to proceed
☐ they are given specialized instruction and tested again before proceeding

8. PREPARATION AND CORRECTION TIME

In this section we are interested in the amount of time teachers spend in lesson preparation and correction of student work. Lesson preparation and correction can occur during time set aside in the school timetable for non-teaching activities, during class lessons while students are working independently, and outside normal school hours.

(a) How much time per week in your timetable is not allocated to teaching and specific non-teaching duties such as sport, but is available for lesson preparation and correction? Do not include lunchtime, assembly time, or staff meeting times.

☐ no time
☐ about 1 hour
☐ about 2 hours
☐ about 3 hours
☐ about 4 hours or more

How much of this time did you spend during the last 5 school days in preparing lessons and correcting work for Grade 5 mathematics?

☐ none
☐ about one-tenth
☐ about a quarter
☐ about a half or more

(b) Teachers sometimes spend time during their lessons doing preparation and correction. Teachers also prepare lessons and correct work outside normal school hours, such as before school starts, after school finishes and at home. Please think carefully back over the last 5 school days and weekend.

Estimate the amount of time you spent:

DURING LESSONS

in lesson preparation and correction for all subjects

☐ none
☐ about 1 hour
☐ about 2 hours
☐ about 3 hours
☐ about 4 hours
☐ 5 + hours

OUTSIDE NORMAL SCHOOL HOURS

in lesson preparation and correction for all subjects

☐ 0-2 hours
☐ 3-5 hours
☐ 6-8 hours
☐ 9-11 hours
☐ 12-14 hours
☐ 14 + hours

Please consider your total preparation and correction time for all subjects over the last 5 school days and weekend, both during daily lessons and outside normal school hours.

How much of this time did you spend in preparing lessons and correcting work for Grade 5 mathematics?

☐ none
☐ about one-tenth
☐ about a quarter
☐ about a half or more

9. HOMEWORK

Have you set homework for most of your Grade 5 maths students during the last 5 school days?

☐ YES

Estimate the total time an average student would take to complete all the mathematics homework set during these 5 days.

——— hrs/mins

☐ NO

Do you believe that mathematics homework should be set for students at this grade level?

☐ Yes ☐ No

10. RESPONSIBILITY FOR YOUR TEACHING

To what extent are you free as an individual teacher to decide about the following aspects of your teaching mathematics to Grade 5 students?	Fully	To a large extent	To some extent	Not at all
The selection of topics for teaching	☐	☐	☐	☐
The selection of instructional materials	☐	☐	☐	☐
The sequence of learning units to give to students	☐	☐	☐	☐
The types of teaching practices to use	☐	☐	☐	☐
The use of achievement tests in the class	☐	☐	☐	☐
The specification of minimum requirement before students can progress to the next level of work	☐	☐	☐	☐

Please tick a box in each row

11. YOUR ATTITUDES TO CURRICULUM AIMS

We have listed 7 important aims of mathematics curricula. Please indicate how much these aims influence your teaching of mathematics to Grade 5 students. Place an M against the two aims which most influence your teaching of the mathematics curriculum. Place an L against the two aims which least influence your teaching of the mathematics curriculum.

	Mark 2 aims M (Most) Mark 2 aims L (Least)
Basic skills in computation and use of common measures	.....
Knowledge of the mathematical terms	.....
Understanding relationships of space, quantity and number	.....
Knowledge of the nature of mathematical investigation and reasoning	.....
Awareness that mathematics is useful in everyday life	.....
An ability to apply mathematical ideas and skills to real-life situations	.....
An ability to show flexibility, fluency and originality in thinking in mathematics-related situations	.....

12. YOUR ATTITUDES TO SOME TEACHING PRACTICES

We would like to know what are your preferred methods of teaching because actual teaching practices are often influenced by many constraining factors such as lack of resources and heavy teaching loads. Suppose you were given the opportunity to teach the class you now have without any of these restrictions.

If there were no organizational constraints, to what extent would you use the following teaching practices for the topics you are now teaching?	A great deal	A moderate amount	A small amount	Very little or none
Giving students a clear indication of exactly what material they are to learn in advance	☐	☐	☐	☐
Diagnostic testing at the end of each topic	☐	☐	☐	☐
Giving students the opportunity to learn through experience with a wide range of concrete materials	☐	☐	☐	☐
Using mathematics text books, worksheets and other written materials	☐	☐	☐	☐
Giving individual students their own learning assignments (i.e. individualized instruction)	☐	☐	☐	☐
Asking students to do exercises and worksheets in order to practise work being taught	☐	☐	☐	☐
Giving students activities which require them to seek out new information and come up with their own conclusions	☐	☐	☐	☐
Allowing students to select their own learning activities, topics and learning units	☐	☐	☐	☐
Instructing the whole class at once	☐	☐	☐	☐
Testing and grading students in accordance with their test performance	☐	☐	☐	☐
Allowing students to do activities other than those specific to the curriculum objectives	☐	☐	☐	☐
Giving students work to be completed by groups	☐	☐	☐	☐

Please tick a box in each row

13. EDUCATIONAL AIMS - SCHOOL AND SELF

Below are two fundamental purposes of primary education. Would you please indicate in the first column the relative weight YOUR SCHOOL gives to each by sharing five points between the two statements. If you wish you can give 5 to one and 0 to the other.

Please put the number you give to each statement in the appropriate box. Please use only whole numbers to make up the total of 5.

In a similar manner indicate in the boxes in the second column the relative weight YOU believe should be given to each.

	YOUR SCHOOL	YOUR IDEAL
The purpose of primary education is to help equip the student with skills and attitudes which will enable him to take his place effectively and competently in society, fitting him to make a choice of an occupational role and to live harmoniously in his community.	☐	☐
The purpose of primary education is to foster the development of the child's individuality and independence enabling him to discover his own talents and interests, find a full enjoyment of life in his own way and arrive at this own attitudes towards society.	☐	☐

APPENDIX II

Table A.1 Proportion of Year 2 Teachers Responding to Each Category for the Items Measuring Teachers' Attitudes to 12 Teaching Practices (N = 231)

	Proportion of teachers responding to each category			
Teaching practice	A great deal (%)	A moderate amount (%)	A small amount (%)	Very little or none (%)
Giving students a clear indication of exactly what material they are to learn in advance	8.2	26.8	31.1	33.3
Diagnostic testing at the end of each topic	28.5	43.3	25.3	2.9
Giving students the opportunity to learn through experience with a wide range of concrete materials	86.3	11.4	2.3	-
Using mathematics textbooks, worksheets and other written materials	8.7	48.3	37.1	5.8
Giving individual students their own learning assignments (i.e. individualized instruction)	36.6	32.7	28.3	2.5
Asking students to do exercises and worksheets in order to practise work being taught	20.8	48.6	24.5	6.0
Giving students activities which require them to seek out new information and come up with their own conclusions	32.0	36.3	28.1	3.5
Allowing students to select their own learning activities, topics and learning units	3.8	22.5	40.4	33.3
Instructing the whole class at once	5.2	37.0	40.4	17.4
Testing and grading students in accordance with their test performance	14.5	40.9	23.8	20.8
Allowing students to do activities other than those specific to the curriculum objectives	7.2	36.5	49.1	7.1
Giving students work to be completed by groups	6.3	41.7	40.9	11.0

Table A.2 Proportion of Year 5 Teachers Responding to Each Category for the Items Measuring Teachers' Attitudes to 12 Teaching Practices (N = 232)

Teaching practice	Proportion of teachers responding to each category			
	A great deal (%)	A moderate amount (%)	A small amount (%)	Very little or none (%)
Giving students a clear indication of exactly what material they are to learn in advance	19.7	37.2	28.1	15.0
Diagnostic testing at the end of each topic	35.0	43.5	17.0	4.5
Giving students the opportunity to learn through experience with a wide range of concrete materials	65.5	31.0	3.5	-
Using mathematics textbooks, worksheets and other written materials	12.4	53.3	29.6	4.7
Giving individual students their own learning assignments (i.e. individualized instruction)	35.3	34.4	23.8	6.5
Asking students to do exercises and worksheets in order to practise work being taught	18.0	58.3	20.3	3.4
Giving students activities which require them to seek out new information and come up with their own conclusions	32.7	43.3	22.2	1.8
Allowing students to select their own learning activities, topics and learning units	2.3	17.0	45.4	35.2
Instructing the whole class at once	10.1	36.2	35.3	18.4
Testing and grading students in accordance with their test performance	16.8	37.6	30.1	15.5
Allowing students to do activities other than those specific to the curriculum objectives	7.4	41.2	41.6	9.8
Giving students work to be completed by groups	10.6	35.5	45.4	8.5

Table A.3 Proportion of Year 8 Maths Teachers Responding to Each Category for the Items Measuring Teachers' Attitudes to 12 Teaching Practices (N = 432)

Teaching practice	Proportion of teachers responding to each category: A great deal (%)	A moderate amount (%)	A small amount (%)	Very little or none (%)
Giving students a clear indication of exactly what material they are to learn in advance	32.1	36.8	23.6	7.4
Diagnostic testing at the end of each topic	53.7	31.8	11.3	3.2
Giving students the opportunity to learn through experience with a wide range of concrete materials	37.8	42.1	17.7	2.4
Using mathematics textbooks, worksheets and other written materials	33.0	56.0	9.8	1.2
Giving individual students their own learning assignments (i.e. individualized instruction)	38.6	27.6	24.3	9.5
Asking students to do exercises and worksheets in order to practise work being taught	34.0	45.9	17.6	2.5
Giving students activities which require them to seek out new information and come up with their own conclusions	19.1	36.6	38.3	6.0
Allowing students to select their own learning activities, topics and learning units	2.8	13.4	42.3	41.4
Instructing the whole class at once	11.1	43.1	34.3	11.4
Testing and grading students in accordance with their test performance	20.5	40.9	24.7	13.9
Allowing students to do activities other than those specific to the curriculum objectives	5.5	28.4	48.5	17.3
Giving students work to be completed by groups	3.3	22.9	50.8	23.1

Table A.4 Proportion of Year 8 Science Teachers Responding to Each Category for the Items Measuring Teachers' Attitudes to 12 Teaching Practices (N = 342)

Teaching practice	Proportion of teachers responding to each category			
	A great deal (%)	A moderate amount (%)	A small amount (%)	Very little or none (%)
Giving students a clear indication of exactly what material they are to learn in advance	20.4	35.5	30.2	13.9
Diagnostic testing at the end of each topic	33.5	39.6	21.7	5.3
Giving students the opportunity to learn through experience with a wide range of concrete materials	60.3	34.4	4.5	0.8
Using mathematics textbooks, worksheets and other written materials	10.5	61.6	25.6	2.4
Giving individual students their own learning assignments (i.e. individualized instruction)	27.1	29.1	32.1	11.7
Asking students to do exercises and worksheets in order to practise work being taught	11.3	44.9	36.5	7.3
Giving students activities which require them to seek out new information and come up with their own conclusions	29.6	42.9	25.3	2.2
Allowing students to select their own learning activities, topics and learning units	7.5	21.8	41.7	29.0
Instructing the whole class at once	13.1	39.5	36.1	11.2
Testing and grading students in accordance with their test performance	12.3	35.7	33.4	18.7
Allowing students to do activities other than those specific to the curriculum objectives	8.3	33.9	45.1	12.7
Giving students work to be completed by groups	9.1	43.7	40.5	6.7

Table A.5 Size of Classes in Each of the Four Samples According to Type of School in which Teachers Worked

Teacher sample	Class size (mean)
Grade 2 sample[a]	
Government schools	30.0
Catholic schools	29.9
Grade 5 sample[a]	
Government schools	30.0
Catholic schools	31.0
Grade 8 maths sample	
Government high schools	24.2
Government technical schools	20.3
Catholic schools	31.9
Independent schools	25.5
Grade 8 science sample	
Government high schools	25.7
Government technical schools	19.3
Catholic schools	33.6
Independent schools	33.6

[a] The class size for Years 2 and 5 refers to the total number of students in classes, and not just number of Year 2 and 5 students (if a composite).

Table A.6 Types of Mathematics Content Areas Taught to Students in Years 2 and 5 during the Five School Days prior to the Survey

	Proportion of topics in this content area	
Content area	Year 2 sample (%)	Year 5 sample (%)
Basic operations and number facts	23.8	27.1
Fractions	5.7	23.2
Measurement	15.2	16.7
Basic properties	19.2	7.2
Spatial relations	2.1	5.3
Pattern and order and place value	26.3	12.2
Statistics and graphs	2.4	4.9
Money	5.3	4.1

Table A.7 Types of Mathematics Content Areas Taught to Students in Year 8 during the Five School Days prior to the Survey

Content area	Proportion of topics in this area (%)
Basic numeration	5.1
Fractions and decimals	20.9
Measurement	17.9
Algebra	21.2
Geometry, trigonometry and spatial relations	21.0
Statistics	2.1
Graphs	11.8

Table A.8 Types of Science Content Areas Taught to Students in Year 8 during the Five School Days prior to the Survey

Content area	Proportion of topics in this area (%)
Biology	39.3
Physics	34.5
Geology	8.9
Chemistry	10.9
Astronomy	3.3
Environmental science	2.9

Table A.9 Time per Week Available for Lesson Preparation and Correction during the School Day for Teachers of Years 2 and 5

	Amount of time				
Teacher sample	None (%)	1 hour (%)	2 hours (%)	3 hours (%)	4 hours or more (%)
Year 2 teachers	23.2	24.7	33.1	15.2	3.9
Year 5 teachers	20.6	23.9	32.0	18.9	4.6

Table A.10 Time per Week Available for Lesson Preparation and Correction during the School Day for Year 8 Maths and Science Teachers

	Amount of time				
Teacher sample	Less than 5 hours (%)	5 hours (%)	6 hours (%)	7 hours (%)	8 hours (%)
Year 8 maths	18.5	16.5	23.1	22.9	19.0
Year 8 science	18.8	13.6	20.5	25.3	21.9

Table A.11 Amount of Responsibility for Various Aspects of Teaching Perceived by Primary School Teachers Working in Different Types of Schools

	Perceived responsibility			
	Year 2 sample		Year 5 sample	
Aspect of teaching	Government school teachers (median)[a]	Catholic school teachers (median)	Government school teachers (median)	Catholic school teachers (median)
Selection of topics for teaching	2.40	1.70	2.42	1.82
Selection of instructional materials	1.43	1.46	1.40	1.57
Sequence of learning units to give to students	1.37	1.15	1.40	1.24
Types of teaching practices to use	1.39	1.20	1.29	1.41
Use of achievement tests in the class	1.55	1.32	1.68	1.51
Specification of minimum requirement before students can progress to the next level of work	1.71	1.29	1.44	1.27

[a] Scale: (1) fully responsible - (4) not at all.

Table A.12 Amount of Responsibility for Various Aspects of Teaching Perceived by Year 8 Maths Teachers Working in Different Types of Schools

	Perceived responsibility			
Aspect of teaching	High school teachers (median)[a]	Technical school teachers (median)	Catholic school teachers (median)	Independent school teachers (median)
Selection of topics for teaching	2.74	2.97	2.40	2.90
Selection of instructional materials	1.32	1.72	1.46	1.44
Sequence of learning units to give to students	1.68	1.83	1.26	2.21
Types of teaching practices to use	1.19	1.43	1.18	1.60
Use of achievement tests in the class	1.25	2.00	1.21	2.75
Specification of minimum requirement before students can progress to the next level of work	1.47	2.24	1.33	1.42

[a] Scale: (1) fully responsible - (4) not at all.

Table A.13 Amount of Responsibility for Various Aspects of Teaching Perceived by Year 8 Science Teachers Working in Different Types of Schools

Aspect of teaching	Perceived responsibility			
	High school teachers (median)[a]	Technical school teachers (median)	Catholic school teachers (median)	Independent school teachers (median)
Selection of topics for teaching	2.76	2.88	2.68	2.62
Selection of instructional materials	1.37	1.42	1.74	1.45
Sequence of learning units to give to students	1.31	1.80	1.97	1.98
Types of teaching practices to use	1.13	1.24	1.22	1.16
Use of achievement tests in the class	1.17	1.51	1.33	1.28
Specification of minimum requirement before students can progress to the next level of work	1.37	2.21	1.80	2.47

[a] Scale: (1) fully responsible - (4) not at all.

Table A.14 Emphasis Placed upon the Societal Aim of Education by Schools According to Type of School

Type of school worked in	Emphasis upon societal aim (median)[a]
Grade 2 teacher sample	
Government primary school	3.28
Catholic school	3.23
Grade 5 teacher sample	
Government primary school	2.85
Catholic school	3.20
Grade 8 maths teacher sample	
Government high school	3.24
Government technical school	3.70
Catholic school	3.05
Independent school	3.10
Grade 8 science teacher sample	
Government high school	3.42
Government technical school	3.19
Catholic school	3.32
Independent school	3.30

[a] Median scores are calculated with a score of 5 reflecting maximum possible emphasis.

Table A.15 Amount of Time Spent in Eight Types of Classroom Teaching-Learning Activities for Year 2 and Year 5 Classes, According to Type of School

	Amount of time			
	Year 2 classes		Year 5 classes	
Type of classroom activity	Government schools (median)[a]	Catholic schools (median)	Government schools (median)	Catholic schools (median)
Whole class instruction	3.42	3.20	3.38	2.89
Small group instruction	3.71	3.53	3.80	3.76
Individual student instruction	3.93	4.02	3.91	3.86
Group work - written assignments	4.50	4.34	4.62	4.36
Group work - concrete materials	3.90	4.00	4.15	4.51
Student independent work	3.66	3.40	3.84	3.16
Student selection of activities	4.64	4.44	3.84	4.68
Peer tutoring	4.35	4.38	4.85	4.22

[a] Median scores are calculated using a 5-point scale: (1) all the time - (5) not at all.

Table A.16 The Amount of Time Spent in Eight Types of Classroom Teaching-Learning Activities for Year 8 Mathematics Classes, According to Type of School

	Amount of time			
Type of classroom activity	High schools (median)[a]	Technical schools (median)	Catholic schools (median)	Independent schools (median)
Whole class instruction	3.37	3.85	3.29	3.43
Small group instruction	4.17	4.36	4.08	4.45
Individual student instruction	3.47	2.98	3.64	3.04
Group work - written assignments	4.84	4.81	4.76	4.84
Group work - concrete materials	4.87	4.81	4.93	4.67
Student independent work	4.39	2.74	3.87	3.20
Student selection of activities	4.95	4.86	4.87	4.97
Peer tutoring	4.30	4.32	4.09	4.05

[a] Median scores are calculated using a 5-point scale: (1) all the time - (5) not at all.

Table A.17 Amount of Time Spent in Eight Types of Classroom Teaching-Learning Activities for Year 8 Science, According to Type of School

	Amount of time			
Type of classroom activity	High schools (median)[a]	Technical schools (median)	Catholic schools (median)	Independent schools (median)
Whole class instruction	3.22	3.11	3.38	3.61
Small group instruction	4.41	4.40	4.48	4.03
Individual student instruction	4.28	4.35	4.41	4.17
Group work - written assignments	4.77	4.88	4.81	4.80
Group work - concrete materials	3.57	3.78	3.71	3.39
Student independent work	4.51	4.51	4.22	4.55
Student selection of activities	4.91	4.92	4.92	4.82
Peer tutoring	4.69	4.75	4.82	4.60

[a] Median scores are calculated using a 5-point scale: (1) all the time - (5) not at all.

Table A.18 Frequency of Assessing Student Performance in Terms of Marks or Course Grades by Teachers in Each of the Four Samples According to Type of School

	Frequency of assessing student performance (%)				
Teacher sample	Never	Every couple of lessons	Every fortnight	Every month	1-5 times per year
Year 2 teachers					
Government schools	4.3	8.9	10.8	32.8	43.2
Catholic schools	4.2	15.6	22.3	25.7	32.3
Year 5 teachers					
Government schools	4.3	14.5	14.3	34.9	32.0
Catholic schools	-	23.0	18.1	41.8	17.0
Year 8 maths teachers					
Government high schools	2.9	8.8	33.2	50.1	5.0
Government technical schools	0.5	19.0	31.3	40.5	8.7
Catholic schools	-	9.5	64.1	21.6	4.8
Independent schools	-	14.2	63.3	16.7	5.8
Year 8 science teachers					
Government high schools	1.5	4.9	15.1	57.7	20.7
Government technical schools	-	11.1	11.9	45.3	31.7
Catholic schools	-	14.7	10.1	62.1	13.1
Independent schools	10.0	6.7	31.9	31.7	19.7

Table A.19 Proportion of Teachers Setting Homework for their Students in Each of the Four Samples According to Type of School

Type of school	Proportion of teachers setting homework (%)
Year 2 teachers	
Government schools	20.9
Catholic schools	35.3
Year 5 teachers	
Government schools	57.6
Catholic schools	79.1
Year 8 maths teachers	
Government high schools	83.3
Government technical schools	75.8
Catholic schools	93.7
Independent schools	100.0
Year 8 science teachers	
Government high schools	47.0
Government technical schools	26.5
Catholic schools	60.9
Independent schools	75.3